PRINTRONIX®

Maintenance Manual

P3000 Printer

P3000 Printer
Maintenance Manual

PRINTRONIX®

P/N 111839–001, Rev C

US and CANADA Radio Interference Note

Note: This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. The manufacturer is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

The input/output (I/O) cable must be shielded for the printer to comply with FCC rules and regulations Part 15 governing the radiation limits for Class "A" equipment.

This Class A digital apparatus meets all requirements of the Canadian Interference–Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

WARNING

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

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ABOUT THIS MANUAL

This manual has been organized and written to make it easy to use. The following information will help you use this P3000 Maintenance Manual.

What This Manual Contains

This manual contains the following information. Consult your table of contents to locate this information.

Introduction – Provides brief printer description.

Principles of Operation – Describes functional operation of printer through the use of block diagrams and associated text.

Preventive Maintenance – Lists detailed procedures required to maintain normal printer operation.

Troubleshooting – Presents fault isolation procedures required to determine the source of common malfunctions.

Corrective Maintenance – Presents procedures for printer adjustment and alignment and replacement of faulty hardware.

Electronic Drawings – Electronic drawings and schematics required for field maintenance are included here.

Parts List – A parts lists, cross referenced to Chapter 5, Section III, is included here.

Controls and Indicators

Throughout this manual, in text, controls and indicators are printed exactly as they appear on the printer, with all capital letters. Controls and indicators that do not have labeled names are given functional names that are printed with the first letter of each word capitalized. For example, the POWER switch has two settings, ON and OFF. The Forms Thickness Adjustment Lever is operated by raising and lowering.

Warnings, Cautions, and Notes

In this manual, extra information is given under the headings WARNING, CAUTION, AND NOTE. They are set off from the text around them and appear in special typefaces. Warnings give information about conditions that could lead to injury. Cautions provide information about conditions that could lead to equipment damage. Both warnings and cautions are printed in **bold** type. Notes provide extra information and are printed in *italics*.

What This Manual Does Not Contain

Detailed, specific information which appears in the User's Reference Manual will not be repeated in the maintenance manual.

CHAPTER l

MAINTENANCE OVERVIEW

1−1. Introduction

This manual contains information required to maintain and repair the *Printronix* P3040 Printer (hereafter referred to as the P3000 Series, or simply, the printer).

The following documents provide detailed information which supplements this manual.

a. P3000 Printer Operator's Guide, P/N 111837−001.
Contains instructions for unpacking, installing, and operating the printer.

b. P3000 Printer User's Reference Manual, P/N 111838−001.
Describes functions and applications available for the P3000 Printer.

1−2. Printer Description (Figure 1−1)

a. General

The *Printronix* P3000 Series Printer is a multi−purpose, dot matrix line printer designed to produce labels and characters, as well as the standard data processing and compressed print character lines and graphics at various densities.

b. Standard Features

l. Configurable for Printronix P Series matrix line printer or serial matrix printer control code protocols

2. Multi−application character printing

3. Graphics plotting

4. Dynamic font selection:
   (a) Selectable pitch − expanded, normal, and compressed
   (b) Shadow printing
   (c) Bold printing
   (d) Auto underlining
   (e) Superscripts and subscripts

5. Double high characters

6. Selectable forms length

7. Nonvolatile electronic vertical formatting

8. Resident international character sets

1−2. Printer Description−continued

b. Standard Features−continued

9. Self−test and diagnostics
10. Test pattern printing
11. Configuration printout
12. Datastream HEX code printout
13. Resident serial and parallel interfaces
14. Selectable alternate horizontal and vertical dot densities
15. Configurable for 13.2 or 13.6 inch print width

c. Optional Features

1. Intelligent Graphics Processor (IGP)
   (a) Forms generation
   (b) Bar code printing
   (c) Expanded character printing
   (d) Reverse image printing
   (e) Rotated character printing
   (f) Logo generation
2. Optional character sets
3. IBM interfaces
   (a) 3282/3287
   (b) 5225/5224
4. Ribbon fault detector

1−3. Operation

a. Operating Procedures

For detailed operating instructions refer to P3000 Printer Operator's Guide, P/N 111837−001.

b. Controls and Indicators

NOTE: The following tables contain a brief summary of control and indicator functions. For a detailed discussion, refer to the User's Reference Manual. For optional controls and indicators refer to the PI 3287 User's Reference Manual (P/N 108174−001).

1. External Controls and Indicators. External controls and indicators are illustrated in Figure 1−2 and described in Table 1−1.
2. Internal Controls and Indicators. Internal controls and indicators are illustrated in Figure 1−3 and described in Table 1−2.
3. Controls and Indicators for Options. Printers configured to emulate an IBM 3287 will have external controls and indicators as shown in Figure 1−4 and described in Table 1−3.

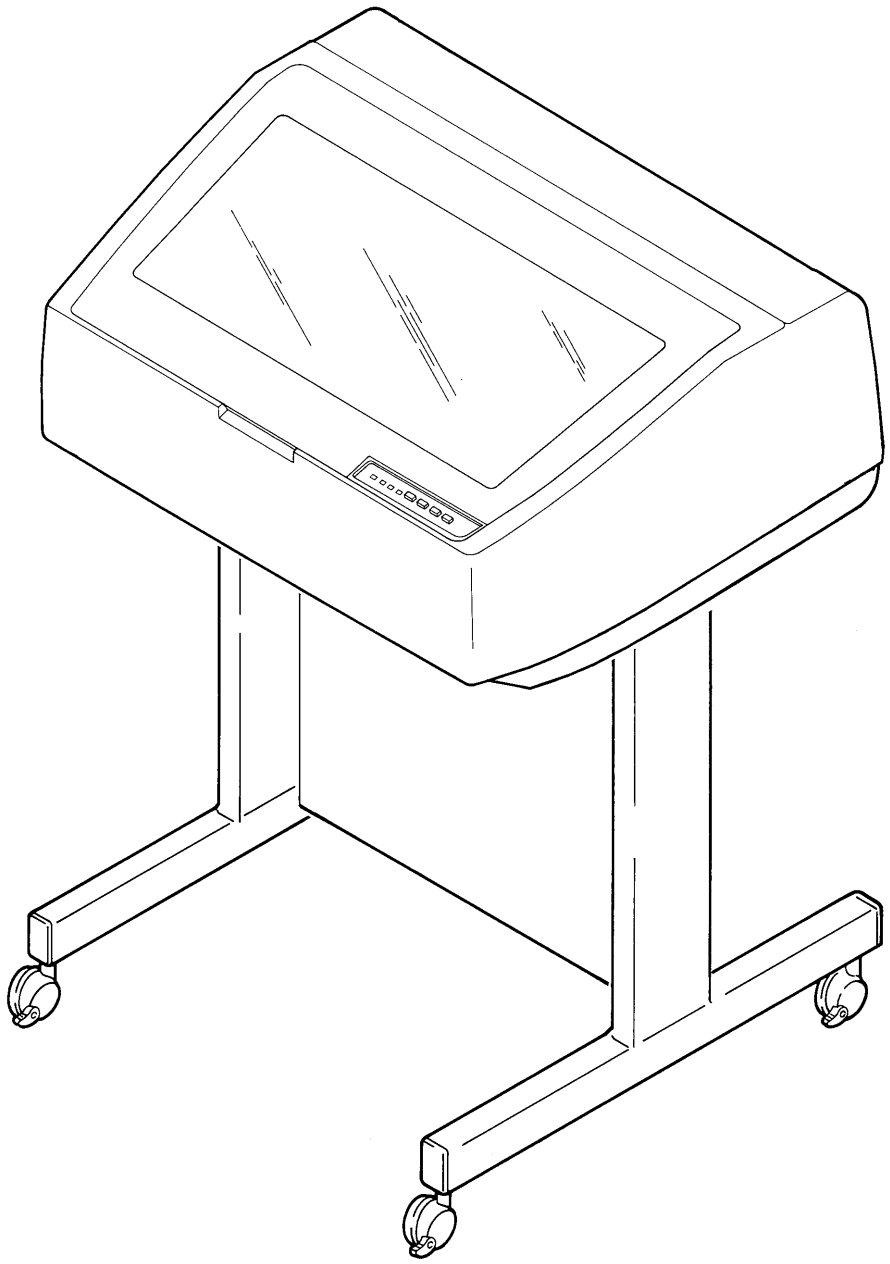


Figure 1−1. Printer with Pedestal

Table 1−1. External Controls and Indicators

Key (Fig 1−2)	Control or Indicator	Function
1	ON/OFF	Applies and removes ac power to printer
2	ON LINE switch	Sets printer online or offline.
3	ON LINE indicator	Illuminates steadily to indicate printer online (ready for computer messages). Flashes to indicate printer offline (not ready to accept messages).
4	CLEAR switch	Resets check circuitry. Used to clear check indicators after corrective action.
5	CHECK indicator	Illuminates to indicate printer problem. Steady light indicates service is required. Flashing light indicates operator correctable problem. Lighting of indicator is accompanied by display of message on internal display panel (see Table 4−1)
6	6/8LPI switch	Selects line spacing of six lpi or eight lpi.
7	8LPI indicator	Illuminates when alternate lpi selected
8	PAPER ADV switch	Moves paper one line when pressed momentarily. Moves paper to top of form when pressed for more than 0.5 second. *NOTE: Top of form must be reset each time new paper is loaded (see operator's guide).*
9	VFU indicator	Illuminates when EVFU is loaded.

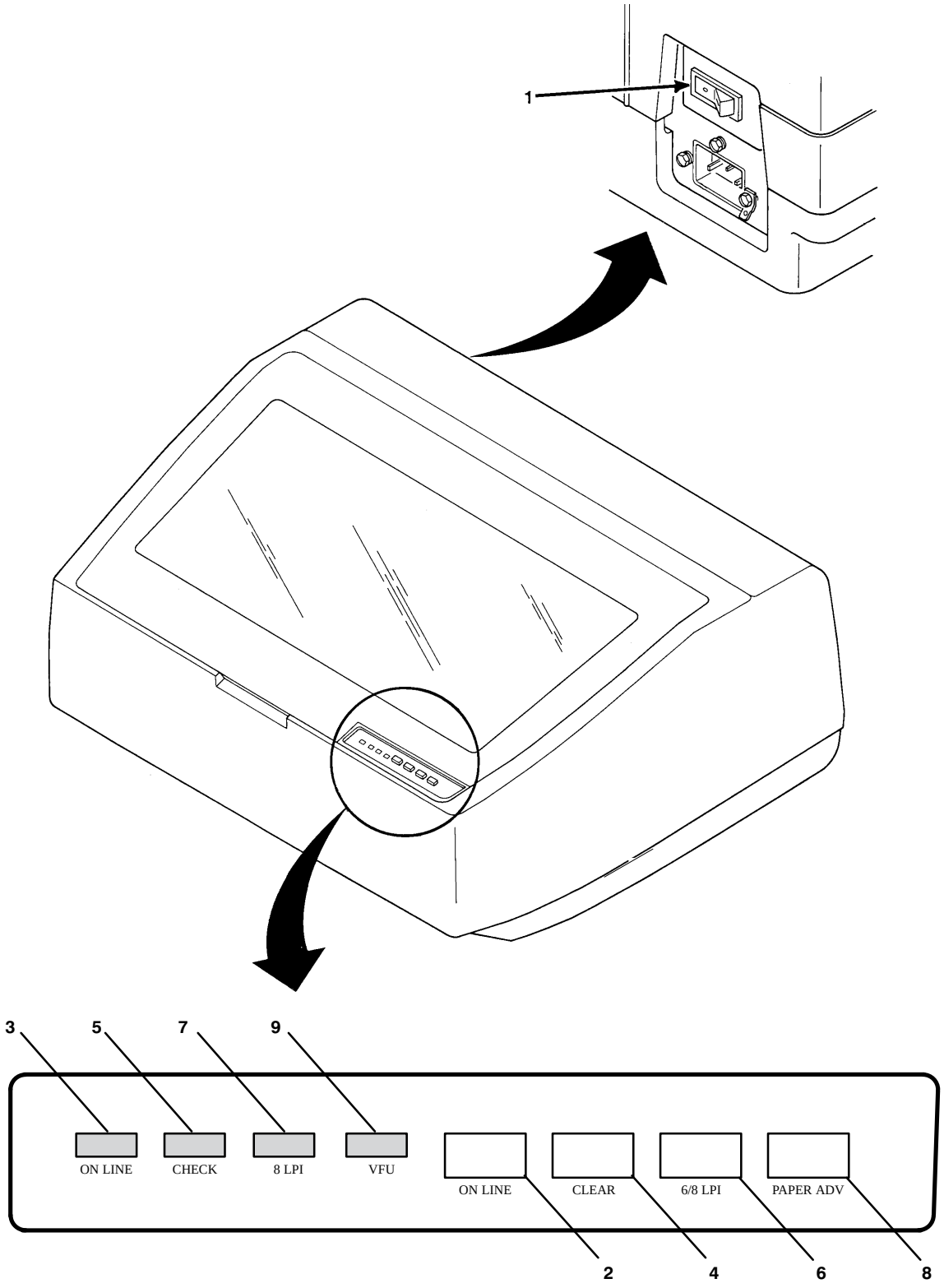


Figure 1−2. External Controls and Indicators

Table 1−2. Internal Controls and Indicators

NOTE: The following electronic controls function only when the printer is off-fline.

Key (Fig 1−3)	Control or Indicator	Function
ELECTRONIC		
1	Display Panel	Displays message for print mode, form length, fault conditions, test patterns, or configuration options. For details, refer to User's Reference Manual.
2	UP switch	Steps display up to next menu
3	NEXT switch	Used in conjunction with PREV switch to display individual configuration parameters and the current values from within various menus.
4	R/S switch	Starts or stops certain printer functions.
5	F/L switch	Used to select form length.
6	MODE switch	Selects type of character print or density of graphic plot. For details on how to select mode, refer to Operator's Guide.
7	ENTER switch	Used to enter a displayed value into memory.
8	PREV switch	Used in conjunction with NEXT switch to display individual configuration parameters and the current values from within various menus.
9	DOWN switch	Steps display down to next menu.
MECHANICAL		
10	Tractors	Provide horizontal positioning of forms.
11	Vertical Alignment Knob (Spline Shaft Knob)	Manually advances forms.
12	Forms Thickness (Platen) Lever	Opens paper path for insertion/removal of paper. Adjusts platen opening to allow for paper thickness or multiple copies.
13	Top of Form Pointer (indicator on tractor doors)	Provides reference when setting top of form after reloading paper.
14	Forms Thickness Indicator	Indicates setting of platen lever.
15	Horizontal Vernier Adjustment Knob	Provides fine horizontal positioning when tractors are locked.

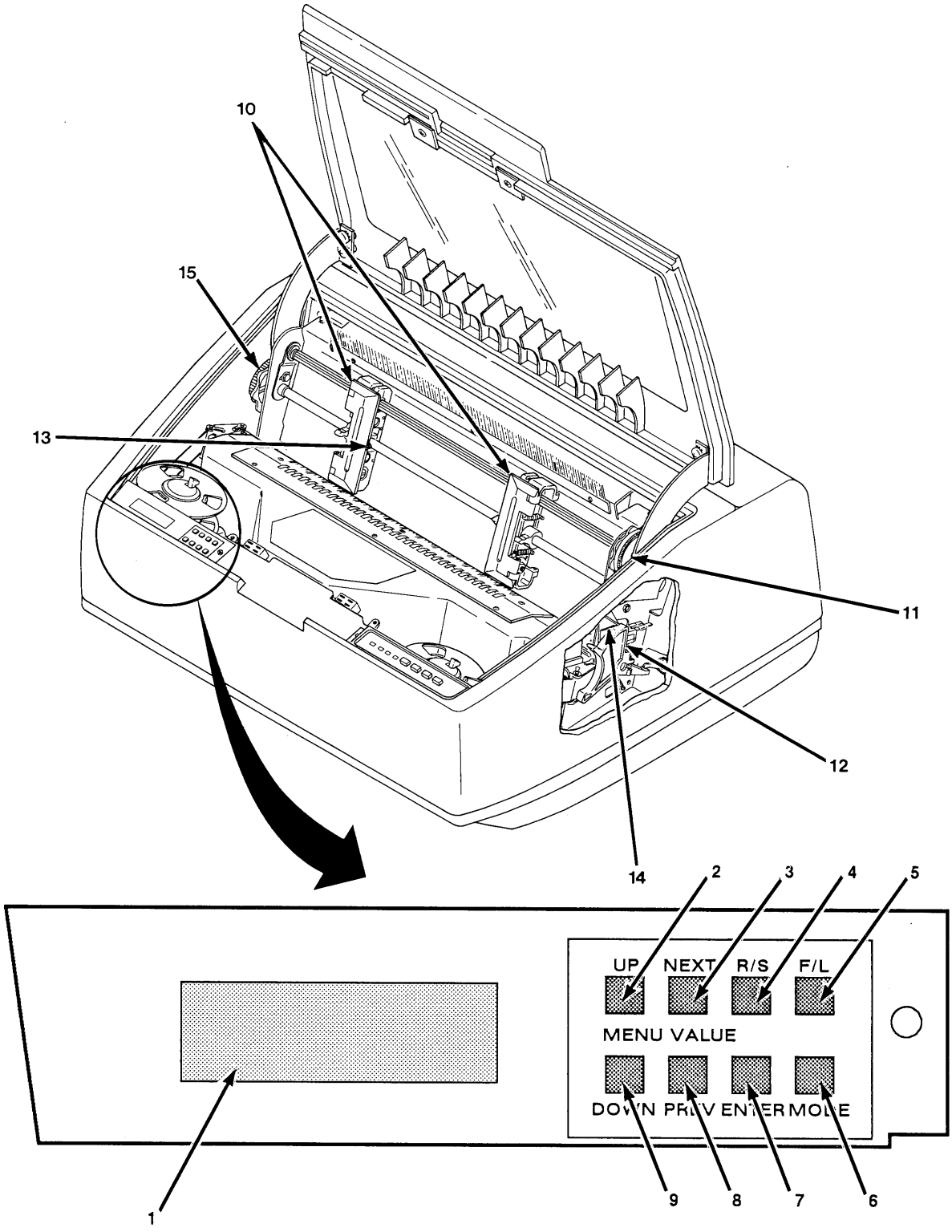


Figure 1−3. Internal Controls and Indicators

Table 1−3. Controls and Indicators for 3287 Option

NOTE: Only those controls and indicators that are not present on the standard panel (Figure 1−3) are discussed below.

Key (Fig 1−4)	Control or Indicator	Function
ELECTRONIC		
1	ENABLE/HOLD switch	Places printer in hold print mode following completion of line being printed. When pressed a second time, enables normal operation.
2	HOLD indicator	Lights to indicate printer is in hold print mode.
3	REPRINT/PA1 switch	Causes reprint of all data in interface buffer in non−SCS modes. In SCS modes, sends intervention required message to host processor. Active only in hold print mode. When used in conjunction with ALT MODE switch, causes program attention signal to be sent to host processor.
4	CANCEL/PA2 switch	No effect in non−SCS modes. In SCS modes, causes printing to stop and SCS print data to be cleared from buffer. Active only in hold print mode.
5	ALT MODE switch	Causes alternate switch functions PA1 and PA2 to become active. Active only in hold print mode. Pressing a second time deactivates PA1 and PA2.
6	READY indicator	Lights to show that printer is ready to print (not in hold print mode).
7	ERROR indicator	Indicates error condition exists.
8	ALT indicator	Indicates alternate mode selected (PA1 and PA2 active).

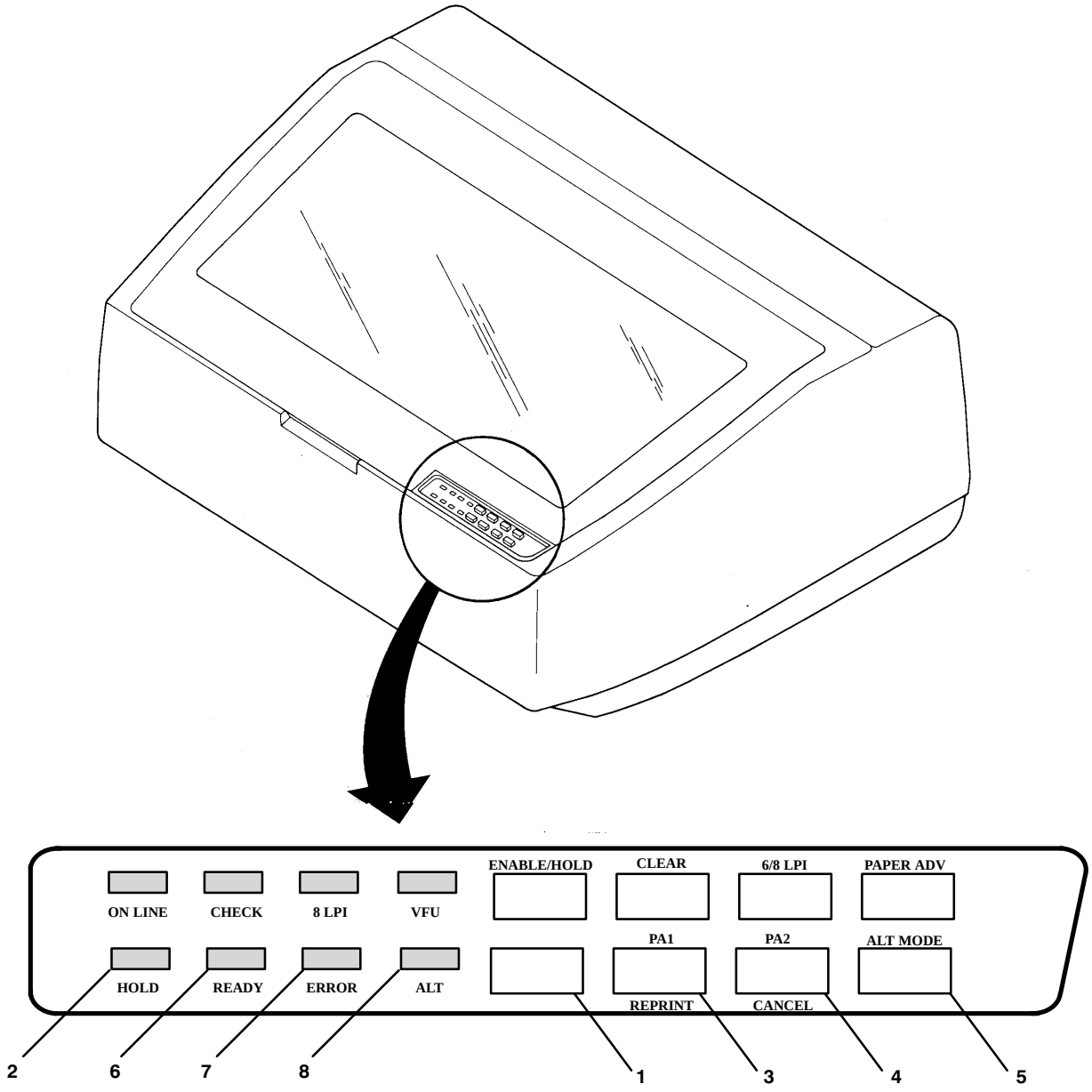


Figure 1−4. Controls and Indicators for 3287 Option

CHAPTER 2

PRINCIPLES OF OPERATION

2−1. General

This chapter presents the principles of operation for the *Printronix* P3000 Series Line Printer. Theory is presented at the functional block diagram level as an aid for performing field maintenance. Refer to Appendix B for detailed schematic diagrams.

2−2. Functional Elements (Figure 2−1)

Functional elements of the printer consist of the following:

a. Paper Transport

b. Printing Mechanism

c. Controller PCBA

d. Mechanism Driver PCBA

e. Power Supply PCBA

2−3. Paper Transport (Figure 2−2)

The paper transport accepts one to six part, continuous fan folded, edge perforated paper (or forms) from three to 16−inches wide. The spline shaft knob is used to manually advance the paper supply vertically. Horizontal positioning of the paper is provided by two tractors which can be adjusted laterally along the spline and support shafts and by a horizontal adjustment knob. When properly positioned, each tractor is then locked in place. Each tractor provides five pin engagement of paper perforation. During printing, tractors are belt driven by the paper drive motor. The paper drive motor is driven by signals from the two paper feed sections of the mechanism driver PCBA.

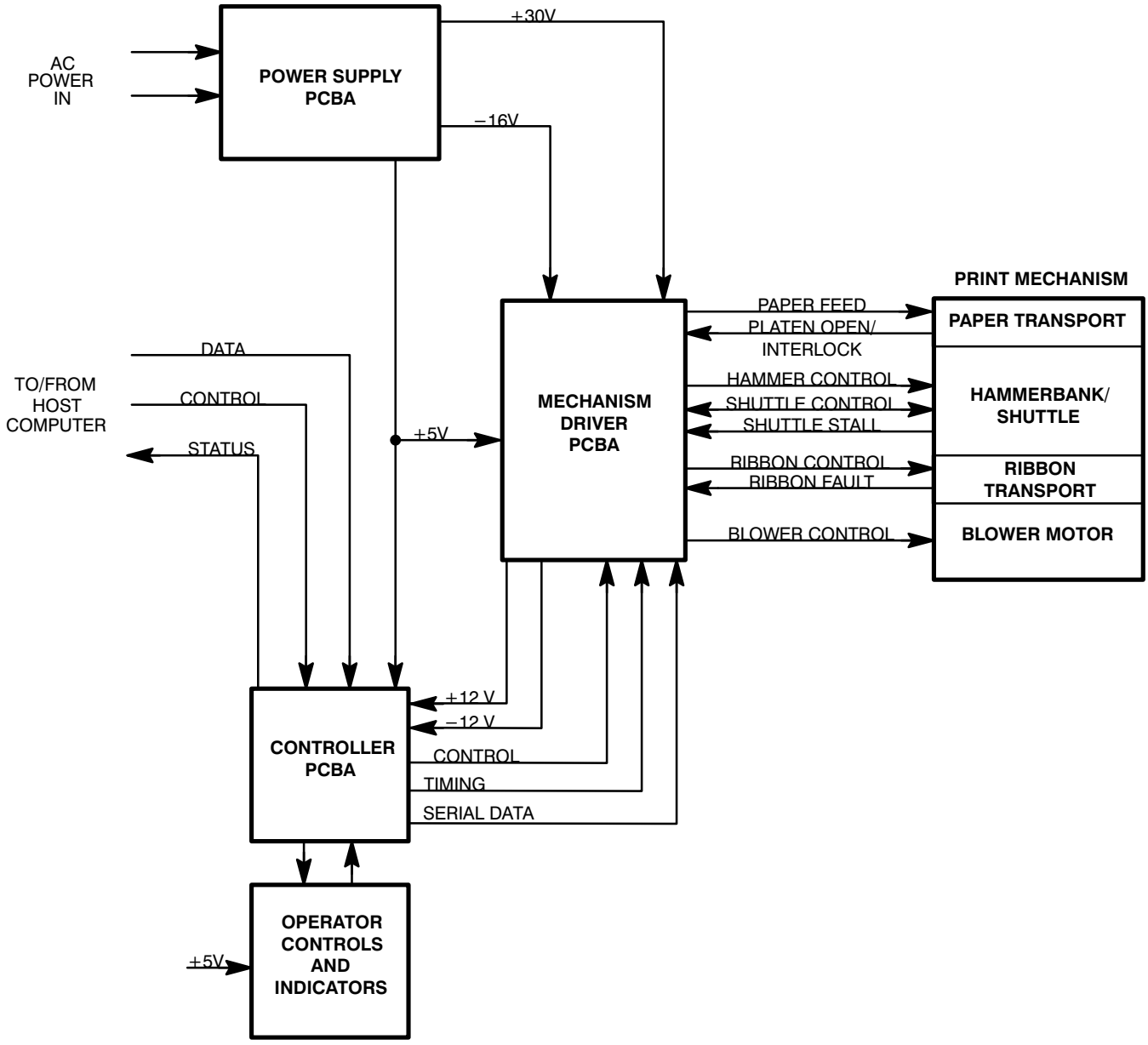


Figure 2−1. Printer Functional Block Diagram

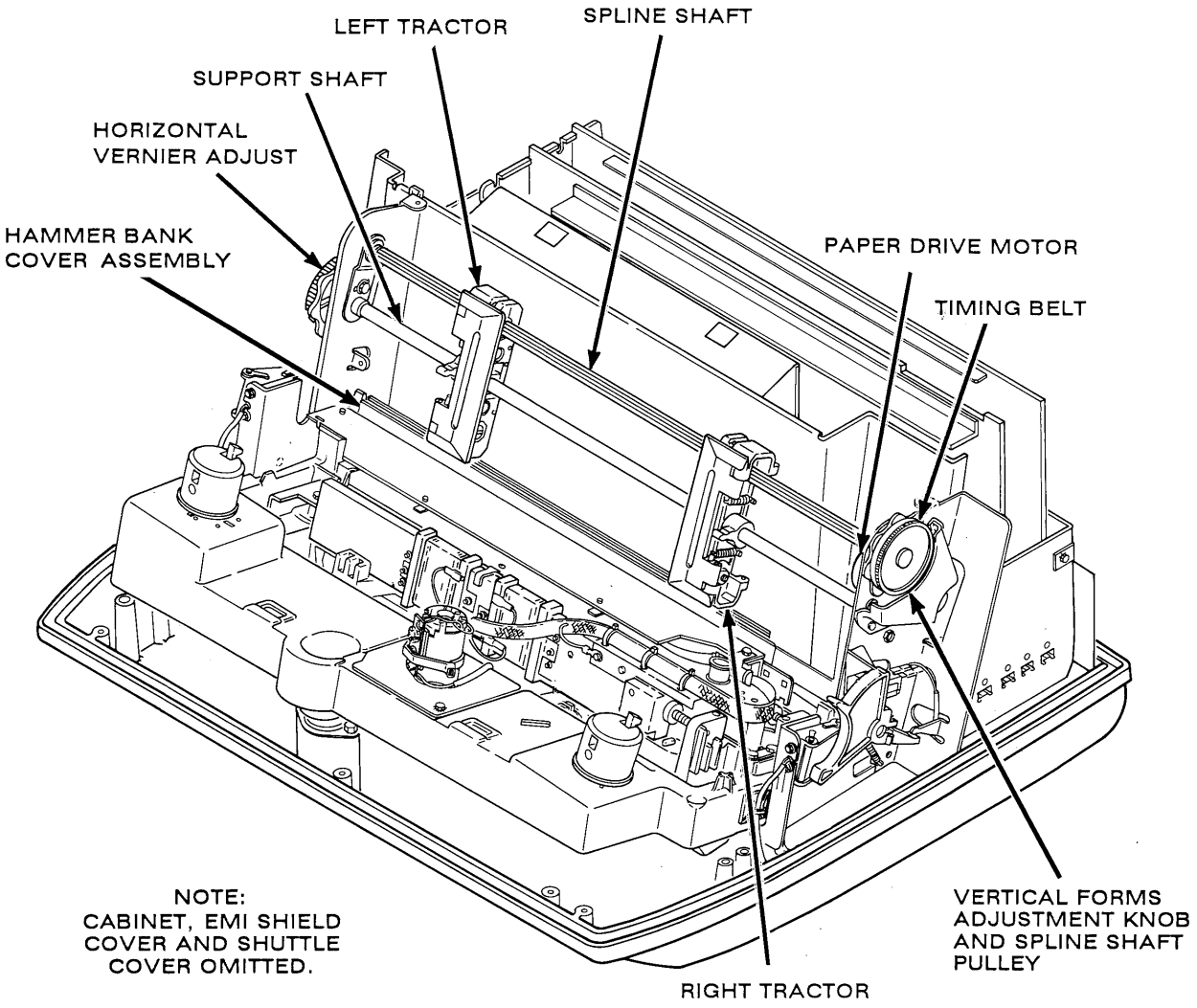


Figure 2−2. Paper Transport

2−4. Printing Mechanism (Figure 2−3)

The printing mechanism consists of the shuttle assembly on which the hammer bank assembly is mounted, and the ribbon transport.

a. Shuttle Assembly

The shuttle assembly consists of the linear motor assembly, two bumper assemblies, two drum assemblies, the hammer bank assembly, hammer bank cable assembly, encoder PCBA, and a linear encoder. The linear motor is driven by the mechanism driver PCBA and sweeps the hammer bank assembly laterally across the 0.4−inch distance traveled by each hammer. The bumpers rebound the hammer bank assembly's inertial energy when the shuttle reaches either end of its travel and reverses direction. The drums, in conjunction with a stainless steel band, provide a bearing action to the hammer bank assembly, allowing it to move with low friction. The optical linear encoder produces timing pulses that are used to determine hammer bank assembly position and speed to synchronize printing.

b. Hammer Bank Assembly

Printing is done by a row of 34 print hammers mounted on the hammer bank assembly. Each hammer consists of a stiff leaf spring with a small, cylindrical tip on one end. It is held securely on the hammer bank by a screw passing through its other end. A permanent magnet running the full length of the hammer bank and acting through individual pole pins holds all 34 hammer springs in the retracted (tensioned) state.

Each print hammer has associated with it a normally deenergized electromagnetic coil mounted on the pole pin (Figure 2−4). The end of this pin magnetically attracts the free end of the hammer spring keeping it under tension. When hammer driver logic determines that the hammer is to print a dot, a current pulse energizes the coil. The polarity of the resulting magnetic field opposes the field of the permanent magnet, releasing the hammer which allows it to impact the ribbon and paper (Figure 2−5) and leave a dot on the paper.

During flight time, the coil is deenergized. As the hammer rebounds after striking, the permanent magnet recaptures the hammer and holds it ready for the next stroke.

In correspondence (NLQ) and data processing (DP) modes, a line of characters is created by a scanning pattern (Figure 2−6). All dots in any row of the dot matrix are printed in a single scan as the shuttle moves from one side to the other through the character columns (spaces).

Figure 2−7 shows the order in which a single character is formed by a single print hammer.

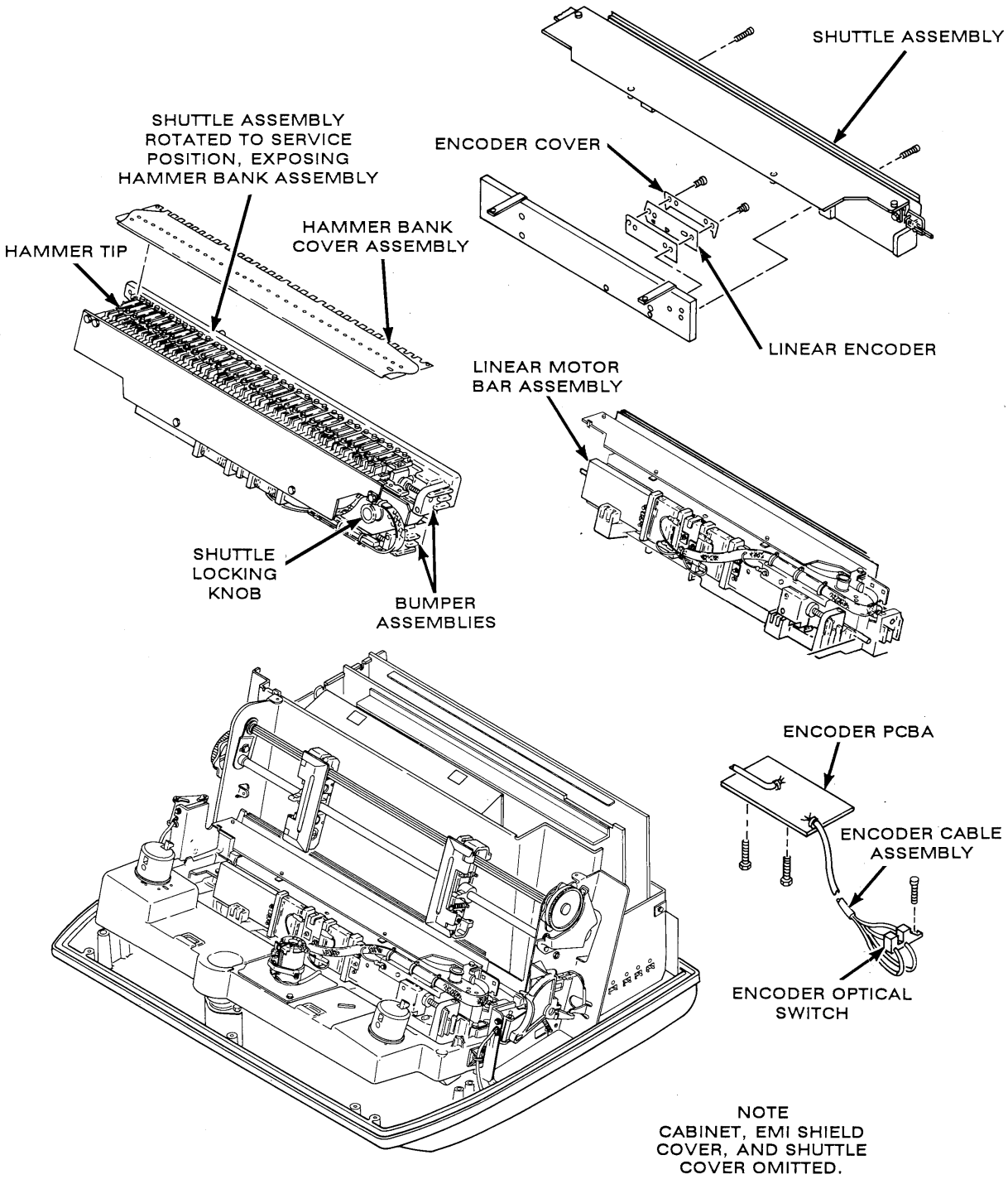


Figure 2−3. Printing Mechanism

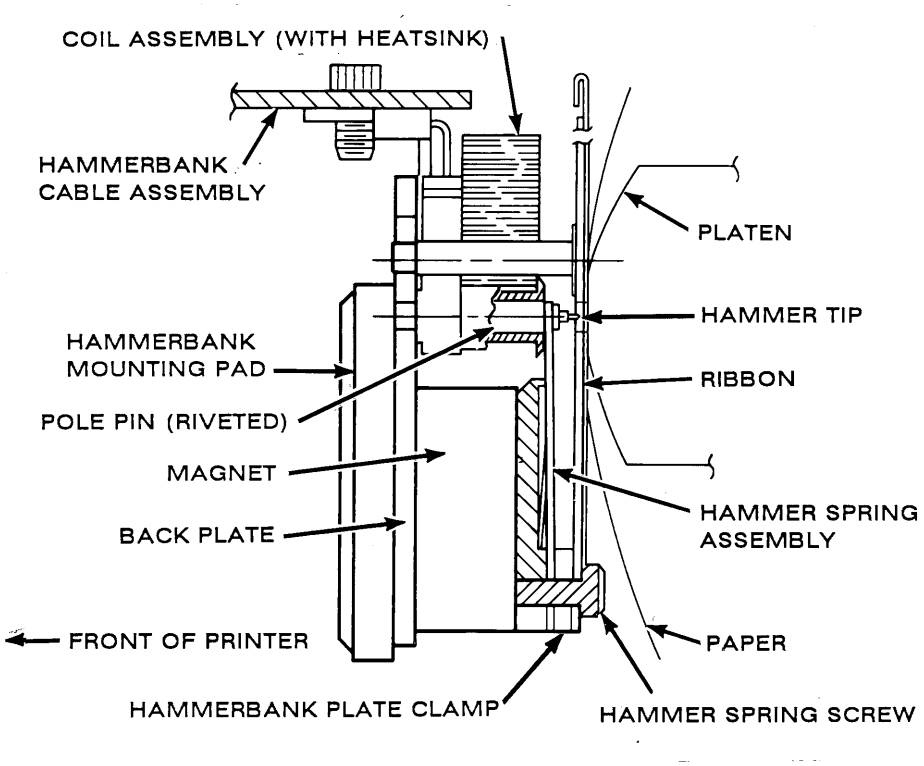


Figure 2−4. Hammer and Shuttle Arrangement, Cross Section

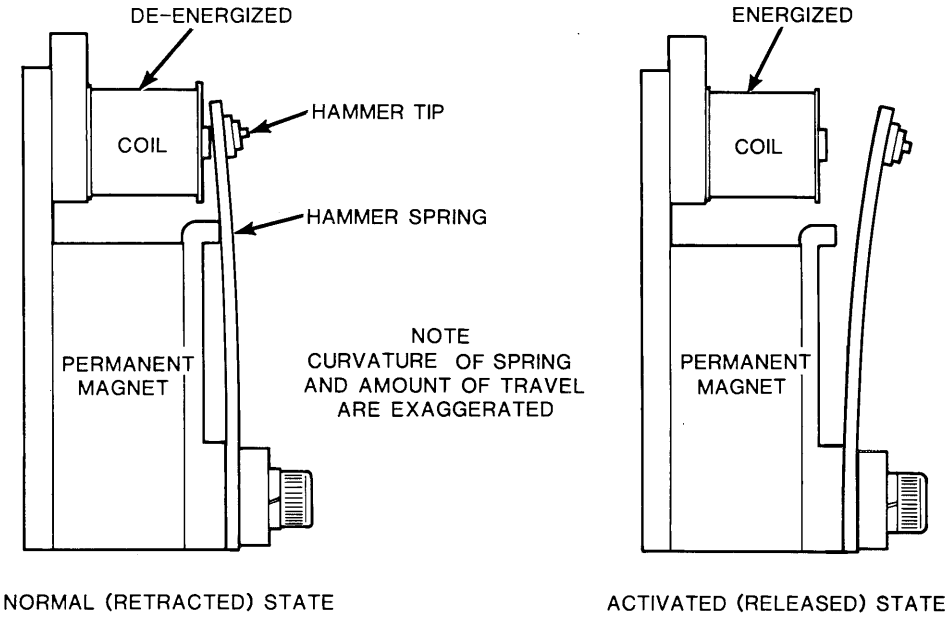


Figure 2−5. Print Hammer Action

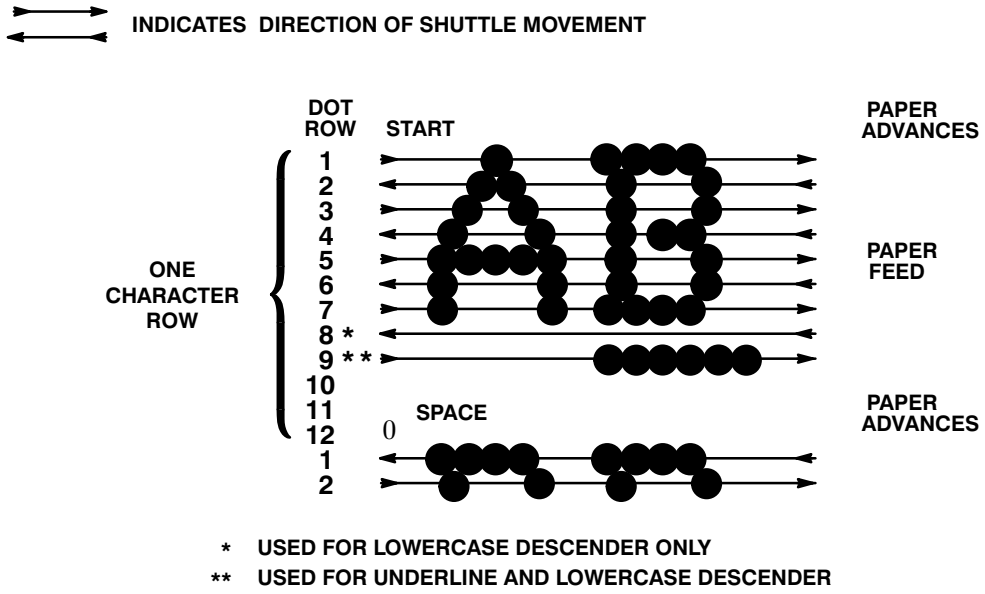


Figure 2−6. Standard Character Formation

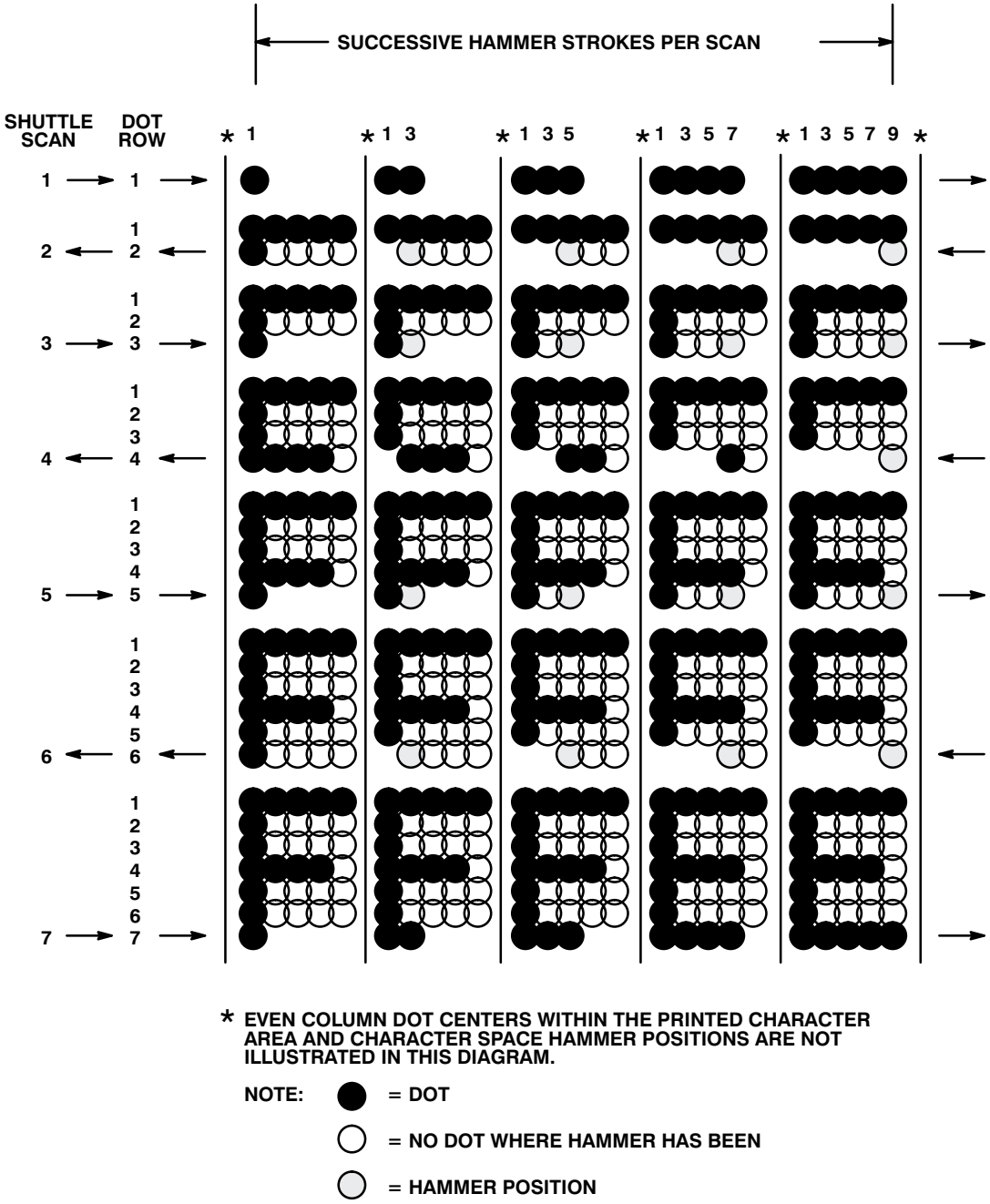


Figure 2−7. Character Formation by One Hammer

The shuttle moves in alternate directions as it prints each successive row of dots. Characters are formed by various dot matrices (Figure 2−8) according to the selected print mode as shown in Table 2−1.

Table 2−1. Dot Matrices vs Speed/Density

Print Mode	Speed (lpm)	Dots Horizontal	Vertical
Correspondence (NLQ)	175	7 on 13 centers	9 plus 3 descenders
Data Processing	300	5 on 9 centers	7 plus 2 descenders
High Speed	400	5 on 9 centers	5 plus 1 descender

In the correspondence (NLQ) mode, for example, lower case characters are formed in 12 rows of a 13 by 12 dot matrix. Seven overlapping dots are printed in the horizontal plane on 13 vertical centers for accurate character rendition.

The dot printing process continues for the number of dot matrix rows determined by the selected print mode. When an entire character line has been printed, the paper transport advances the paper to the top dot row of the next character line to be printed. During the line advance, the hammer bank assembly continues the right/left sweeping motion; at this time, however, the print hammers are disabled from printing.

c. Ribbon Transport

The printer ribbon advances continuously on spool hubs. Ribbon motors are driven while the hammer bank assembly is running and stop when it stops. Ribbon motion is reversed when the foil at either end of the ribbon is detected.

Constant ribbon tension is maintained by controlling the motors with a differential drive circuit. While the hammer bank assembly is in motion, one motor acts as a driving motor drawing the ribbon against the resistance exerted by the other motor. This system operates to maintain a constant motor speed and constant ribbon tension. When the end of the ribbon is detected, the two motors reverse direction.

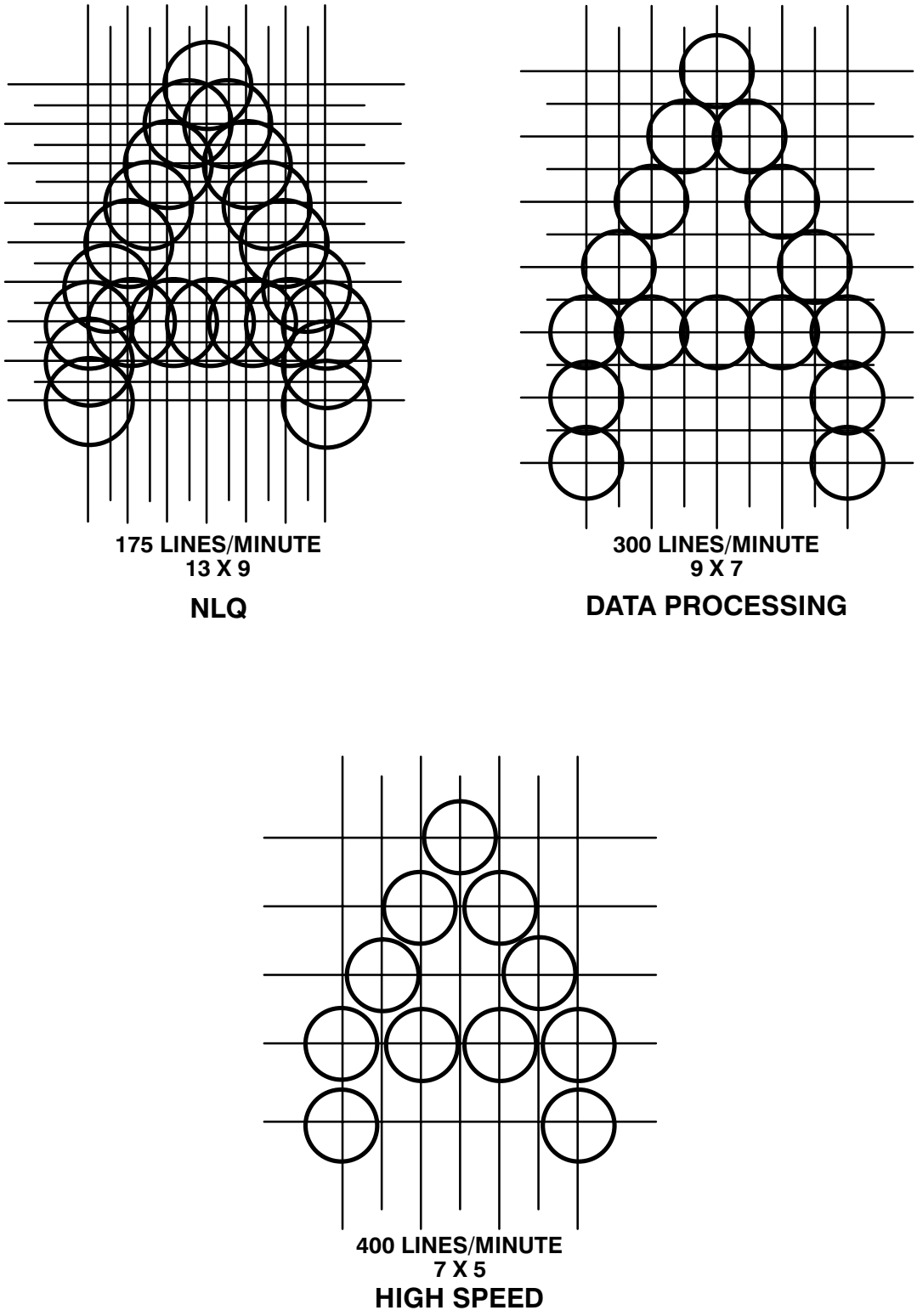


Figure 2−8. Typical Character Dot Patterns, By Mode

2−5. Controller PCBA (Figure 2−9)

The controller PCBA contains logic circuits for communicating with the host data source, the operator control panels, and the mechanism driver PCBA. It is configured to accept any one of three data formats, two parallel (Centronics, Data Products) and one serial (RS 232).

Functionally, the controller PCBA is divided into two sections: the data control unit (DCU) and the mechanism control unit (MCU). The DCU and MCU each contain a Z80 CPU microprocessor to control their operation.

a. Data Control Unit (DCU)

The DCU microprocessor controls data operations between the host controller and the printer.

The DCU receives coded information from the host that determines characters to be printed, font selection, line spacing, plotting, EVFU selection, elongated characters, and paper movement. In turn, the DCU returns status data to the host.

Hammer Serial Data Multiplexer.

After data is received at the MCU RAM, the MCU, through the general purpose interface status register, then informs the DCU that it is available for processing the next character. The character from the MCU RAM buffer memory is loaded into the hammer serial data multiplexer.

The output of the hammer serial data multiplexer is applied serially to the input of the serial shift register on the mechanism driver PCBA. This is accomplished via the compare (COM) line.

b. Host Interface (Parallel)

When the printer is on line and ready to operate, it sends “ready” (READY) and “on line” (ONLINE) output signals to the host controller via the host interface. When the host controller is ready to transfer a byte of code, it puts the byte on the host interface data lines: DATA 1 through DATA 8, followed by a data strobe (DATA STROBE) pulse. DATA STROBE loads the byte into the interface latches. DATA STROBE also sets the data available (DAV) interrupt latch, which is polled by the microprocessor.

Upon receiving DAV, the CPU uses an input service subroutine in program memory. The microprocessor sends addressing information to the DCU I/O port decoding logic. The decoder will generate a read host data (NRDHDATA) in response. This action transfers the host’s data byte or control byte onto the DCU data bus (DD0−DD7). Next, the CPU generates a write control (NDWR) signal, which is used to store the byte of data in random access memory (RAM). NWRCTRL1 is applied to the host interface circuitry to generate NACK. The NACK signal is sent to the host controller to indicate that the printer is ready to receive the next byte of data.

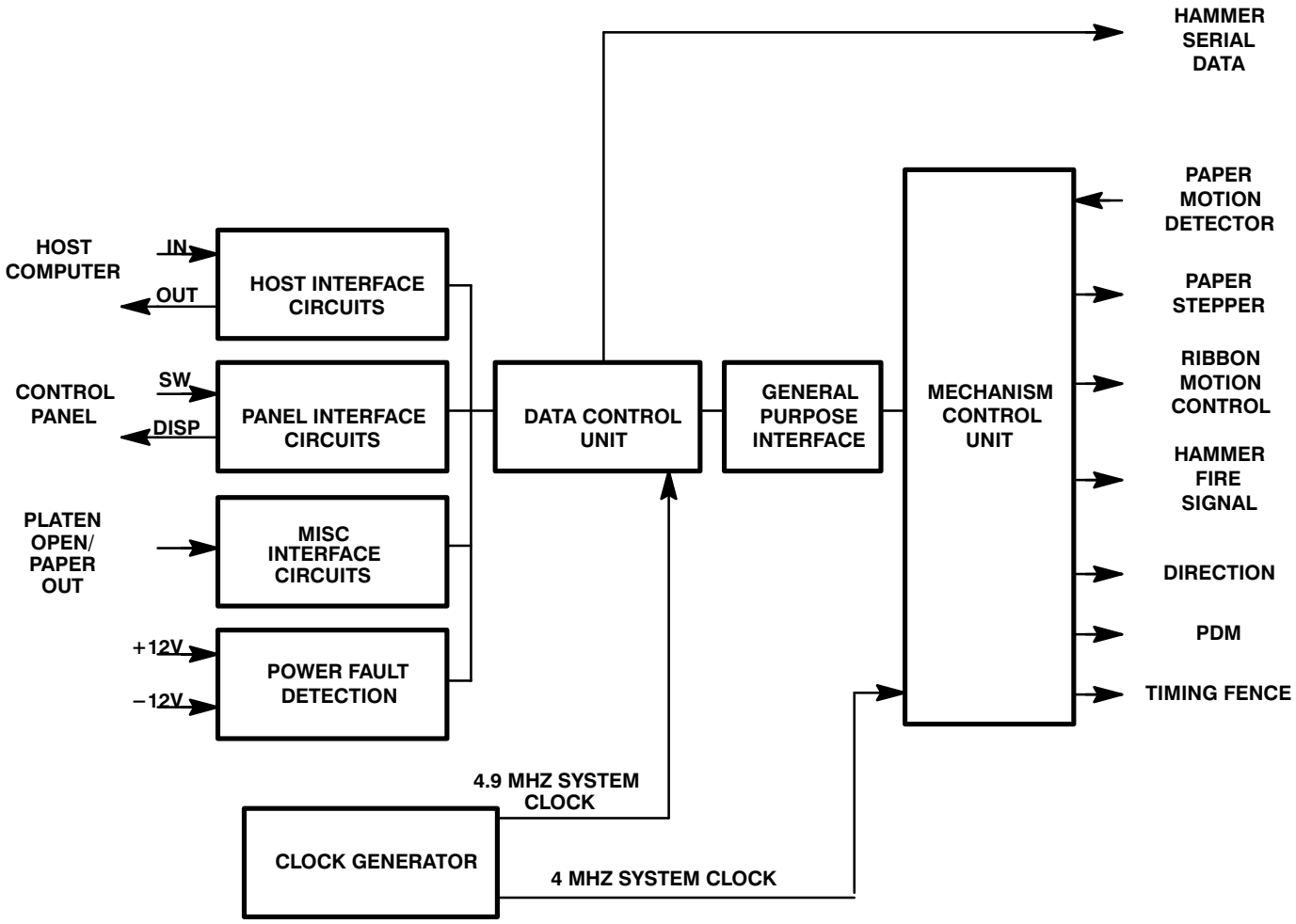


Figure 2–9. Controller Block Diagram

2−5. Controller PCBA−continued

c. Mechanism Control Unit (MCU)

The MCU controls the printing mechanism and the paper transport via the mechanism driver PCBA, and monitors the shuttle direction and speed.

1. Paper Advance.
   Paper advance is controlled by paper feed pulses (PF1, PF2, NRUN1, and NRUN2) generated in the MCU then sent to the mechanism driver PCBA which supplies power to the paper feed motor.

   Paper drive speed is controlled by three functions. As each motion command in the printer buffer is encountered, a counter is loaded with a count value proportional to the amount of paper motion identified by that command.

   A particular modulus of count is used to determine the spacing between dot rows. The spacing depends on the mode in effect.

   Through the logical interaction of these functions, paper is moved. The motion is either intermittent or steady with appropriate response to any required change of speed at any time during the paper feed cycle.

2. Ribbon Motion.
   Ribbon motion is controlled by the RIB PARK signal which causes equal tension to be applied to both ribbon motors causing ribbon motion to stop and by the RIB signal which allows the ribbon to move whenever the shuttle is in motion.

3. Pulse Duration Modulator (PDM) Shuttle Drive Generator.
   At the PDM shuttle drive generator, a byte of motion data is presented to the shuttle drive generator latch and is loaded into it by a NWRSTLMTR pulse. Bit 0 is sent immediately to the mechanism driver PCBA where it determines the direction the hammer bank assembly is to take. Bits 1 through 7 are applied to the generator's counter and are loaded into it when the 32 microsecond pulse is coincident to MSYSCLK. The high order bit of the counter is set to a high or low state and remains at that level until the counter count progresses far enough to change it. The result is a pulse width modulated signal (NLMD) which is sent to the linear motor driver to control shuttle speed. The width depends on the contents of the byte latched into the generator.

2−6. Mechanism Driver PCBA

The mechanism driver PCBA contains those circuits required to drive the printing mechanism. These driver circuits are under control of the controller PCBA. The mechanism driver PCBA also produces, by use of regulators, the +12 Vdc and −12Vdc required by the controller PCBA for the serial interface. The +12 Vdc is derived from the +30 Vdc output of the power supply PCBA, while the −12 Vdc is derived from the −16 Vdc output of the power supply PCBA.

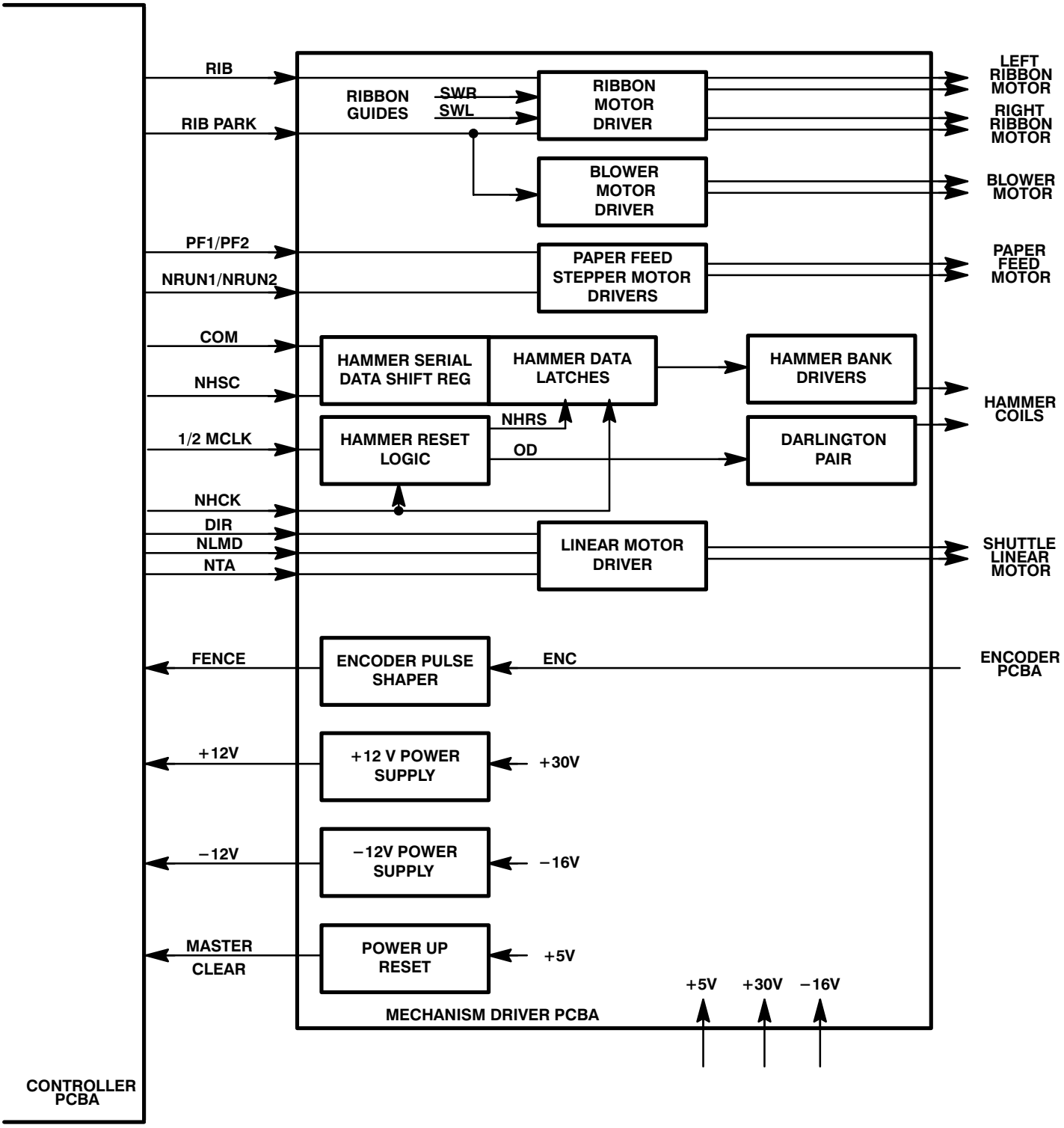


Figure 2−10. Mechanism Driver Block Diagram

2−6. Mechanism Driver PCBA−continued

The mechanism driver PCBA contains driver circuits for the printing mechanism as follows (Figure 2−10):

- −Hammer Bank Drivers and Logic
- −Linear Motor Driver
- −Ribbon Motor Driver
- −Paper Feed Motor Drivers
- −Blower Driver
- −Optical Encoder Signal Conditioning

a. Hammer Bank Logic

The hammer bank logic consists of a serial shift register. The serial data output (COM) of the hammer serial data multiplexer on the controller PCBA is clocked into the shift register by the hammer shift clock (NHSC). After the data is shifted in serially, it is strobed to the shift register parallel outputs by hammer clock (NHCK) which is sent from the controller PCBA. Each output of the shift register latch is connected directly to the input of the corresponding hammer driver circuit (Figure 2−11).

1. Hammer Reset/Overdrive Logic. The hammer reset/overdrive logic is used to generate the signals, hammer reset (NHRS) and overdrive (OD). NHRS is used to enable/disable the outputs of the shift register. OD is used to speed generation of the electromagnetic field which results in hammer release by causing an initial extra high current to be applied. NHRS causes the drivers to turn off. NHRS and OD are derived from signals from the controller PCBA: hammer clock (NHCK), which loads data into the hammer data latches; and 1/2 MCLK, the system clock.
2. Hammer Bank Drivers. The hammer bank drivers consist of identical drivers (one for each hammer coil) and three identical Darlington drivers. Each Darlington driver energizes a portion of the hammer coils while the others energize the remaining hammer coils.

When a hammer is to print, its hammer driver is turned on by the data latch output, and the return path to −16 Vdc for the associated hammer coil is completed. Simultaneously, the Darlington drivers are turned on by OD, and +30 Vdc is applied to all the coils. Each of the coils that has its hammer driver enabled by the data latch is energized. When the coil is energized, the hammer is released to print.

After a time delay, +30 V HB is disconnected from the coil when OD turns off the Darlington drivers. A constant −16 V is applied to the coils to sustain coil current and is turned off when NHRS clears the data latch.

b. Linear Motor Driver

The linear motor driver provides drive for the two linear motor coils on the shuttle and consists of two push/pull drivers and control circuits. The three inputs to the linear motor drivers (NLMD, DIR, and NTA) come from the MCU section on the controller PCBA. The linear motor drive pulse (NLMD) is a pulse−width modulated signal generated by the shuttle drive generator. The shuttle speed is directly proportional to pulse width. The longer the drivers are on, the faster the shuttle is driven by the linear motors.

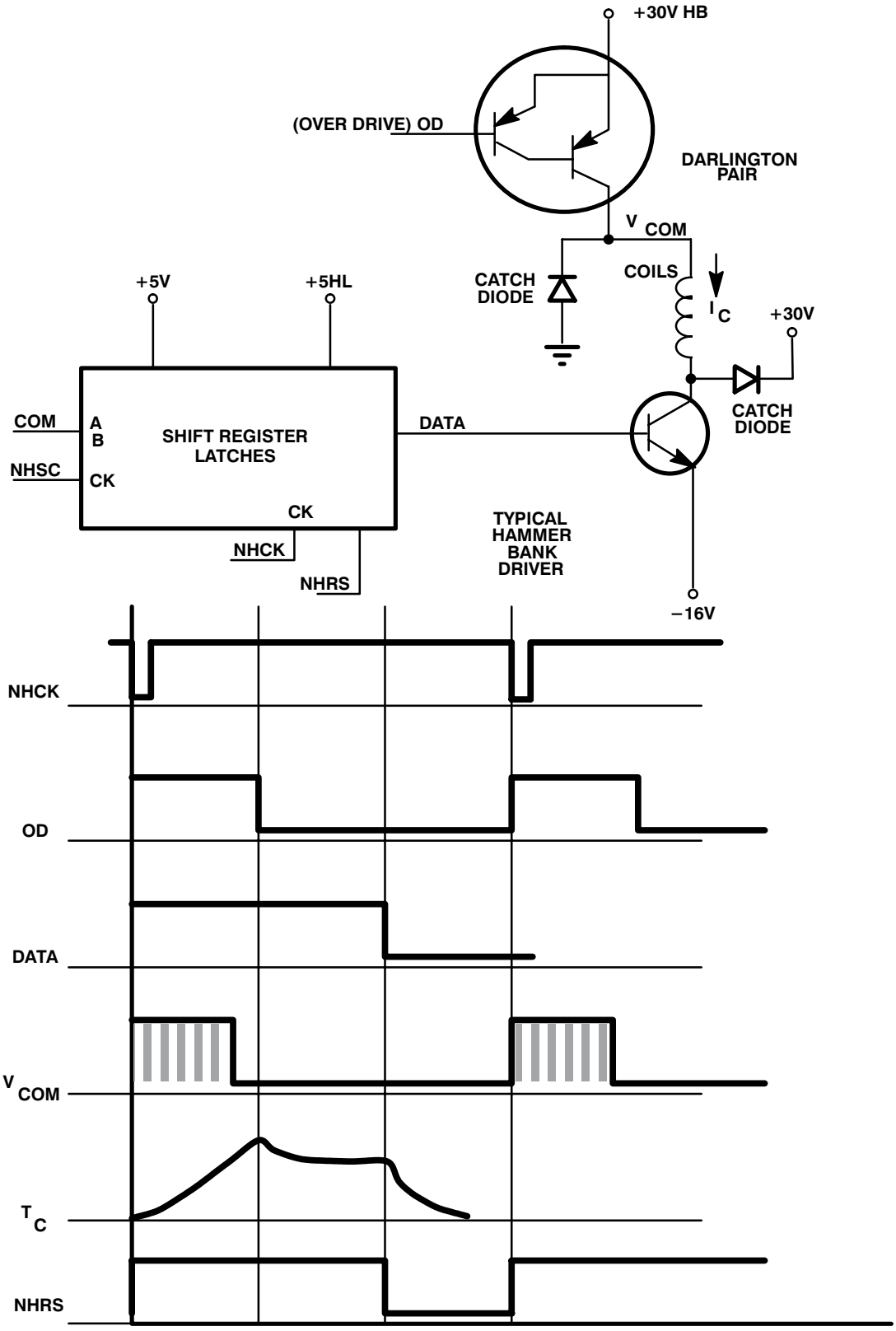


Figure 2−11. Hammer Bank Logic, Drivers, and Waveforms

b. Linear Motor Drive−continued

The direction (DIR) input also is generated by the shuttle drive generator on the controller PCBA and is used to control the left and right shuttle direction by steering the polarity of the NLMD pulses to the linear motor drivers. The remaining input signal to the linear motor drivers is the turnaround (NTA) signal which is sent from the controller PCBA.

c. Ribbon Driver.

The ribbon driver circuits (Figure 2−12) drive the ribbon from one reel to the other as it passes between the hammer bank and the platen. The direction of ribbon travel is reversed automatically as the end of ribbon is detected by sensors on the ribbon guide. A metal strip at each end of the ribbon provides the end of ribbon indication.

The ribbon is driven by two dc motors in a servo circuit. For either direction of travel, one motor is the driven motor, drawing the ribbon against resistance exerted by the other motor. This system maintains constant motor speed and ribbon tension. When the end of ribbon is detected, the two motors exchange roles. The ribbon is in motion only while printing is taking place.This activity is controlled by the ribbon (RIB) and ribbon park (RIB PARK) signals from the MCU on the controller PCBA.

Whenever an end−of−ribbon sensor (RIB SWR or RIB SWL) is activated, it establishes the opposite state of the cross coupled latch at the input of the ribbon driver circuit to turn on the related FET. If, for example, the left hand sensor (RIB SWL) resets the latch, FET 1 is turned off and FET 2 is turned on. With FET 2 turned on, the output to the left ribbon motor driver is increased considerably by a voltage divider network. This connects the left ribbon motor as the higher torque motor, with the right ribbon motor providing drag for ribbon tension.

When right end of ribbon is detected, the latch is set to the opposite state and control circuits and motors reverse roles. When no printing is taking place, RIB PARK is high and both FETs are turned off. The motors then act in equal opposition to stop ribbon movement. RIB PARK also is applied to the blower motor driver circuit. There, it is used to turn off the blower when printing is not in progress.

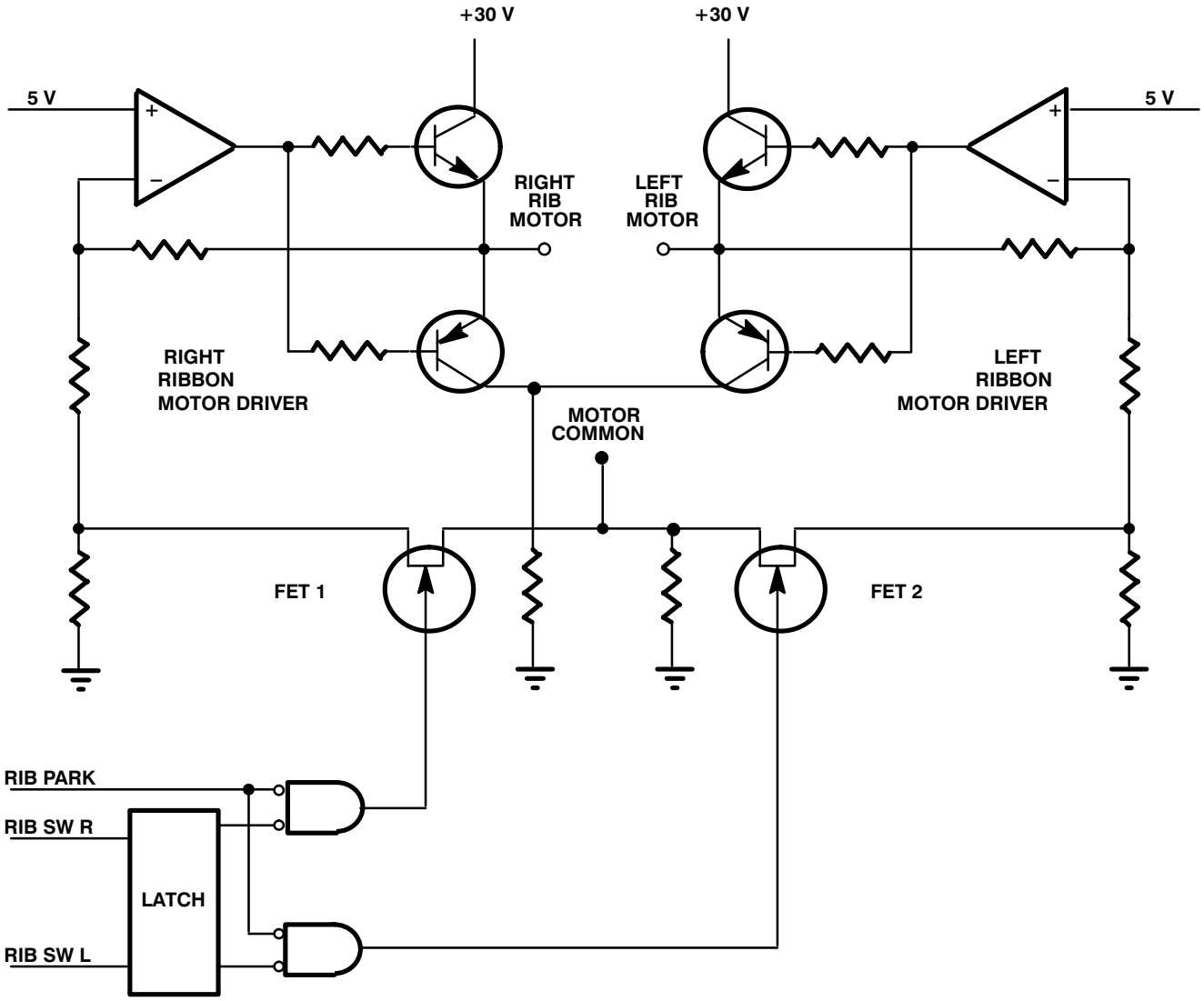


Figure 2−12. Ribbon Driver Circuit

d. Paper Drive Motor Drivers

The paper drive motor is an incremental (stepper) motor containing two pairs of coils. One pair of coils is driven by paper feed motor driver signals PF1/NRUN1, while the other pair is driven by PF2/NRUN2. The paper feed motor drivers are controlled by paper feed pulses, PF1 and PF2. NRUN1 and NRUN2 are enable signals used in conjunction with PF1 and PF2 to prevent spurious paper motion.

Paper feed pulses are under program control and require no manual intervention. PF1/NRUN1 and PF2/NRUN2 pulses control the identical and essentially independent drive circuits. Each drive circuit operates in like fashion.

The paper feed pulses are gated to a push−pull amplifier to provide current through that pair of the motor coils. A constant current controller circuit is used to stabilize the inductive current pulses (smoothing paper drive operation and protecting circuit components). This controller circuit monitors current flow through the motor coils and controls the duration of the pulses applied to the push/pull driver. The effect of this circuit is to maintain motor coil current at a relatively constant value, while still permitting the motor shaft to move at variable speeds.

The motor coil current is monitored across a 0.1 Ohm resistor connected to the ground side of the push/pull driver. The voltage drop across this resistor controls the limiting action of the circuit and drives a low pass filter. The filtered output signal is an error input signal to the controller circuit. The stages of the controlled circuit are referenced to VREF and RAMP. RAMP and VREF work together with NRUN1 and NRUN2 to set the pulse width of the signals sent to the paper feed motor.

The output of the controller is a pulse with a duration proportional to the input error signal. This variable width pulse is used to gate the paper feed pulses to the push/pull drivers and consequently vary the duration of the motor drive pulses to control the current.

2−6. Mechanism Driver PCBA−continued

e. Power−up Reset Logic

The power−up reset logic is used to generate the master clear signal (NMC). This circuit is activated (NMC is low) by sensing the presence of +5 Vdc when power is turned on initially.

The +5 Vdc charges an RC network which then turns the circuit off (NMC high). NMC is used to clear the microprocessors on the controller PCBA to establish the initial program load state.

f. Encoder Circuit

The encoder circuit accepts the analog output of the encoder preamplifier located on the shuttle. The function of this circuit is to shape the analog input (ENC) to digital pulses (FENCE) at the output. The output is applied to the controller PCBA for timing computations which are used to maintain shuttle and print control.

g. Power Supplies.

The +12 Vdc and −12 Vdc power supplies are located on the mechanism driver PCBA. The +12 Vdc supply is derived from the +30 Vdc input to and the −12 Vdc supply is derived from the −16 Vdc input to provide −12 Vdc at the output.

2−7. Power Supply PCBA

The power supply PCBA is a switching power supply. Its regulated outputs are +5 Vdc, −16 Vdc and +30 Vdc. While all outputs are supplied to the mechanism driver PCBA, only +5 Vdc is supplied to the controller PCBA, the control panel PCBAs, and the encoder PCBA.

CHAPTER 3

PREVENTIVE MAINTENANCE

3−1. General

This chapter provides instructions necessary to maintain the printer in operating condition.

3−2. Preventive Maintenance Checks and Service (PMCS)

Printer PMCS are listed in Table 3−l.

❑ **WARNING** ❑

Remove power before performing PMCS. Failure to do so could result in injury or equipment damage.

NOTE: Perform PMCS every six months or after 500 hours of operation, whichever comes first. Perform them more often when operating under severe conditions.

Table 3−1. Preventive Maintenance Checks and Service

Item No.	Name	Procedure
1	Entire Printer	Perform overall physical inspection per paragraph 3−3. Do not disassemble for this inspection.
2	Entire Printer	Clean per paragraph 3−4.
3	Entire Printer	Run print sample, adjust hammers if/as required.
4	Timing Belt	Check tension per paragraph 3−5.
5	Tractor Belts	Check tension per paragraph 3−5.

3−3. Inspection

Visually inspect printer using Table 3−2 as a guide. Perform no disassembly for this inspection. Correct any condition that could affect performance or reliability.

3−4. Cleaning

❑ **CAUTION** ❑

Do not use abrasive cleaners, particularly on window. Do not drip water into printer. Damage to equipment will result.

a. Exterior of Cabinet

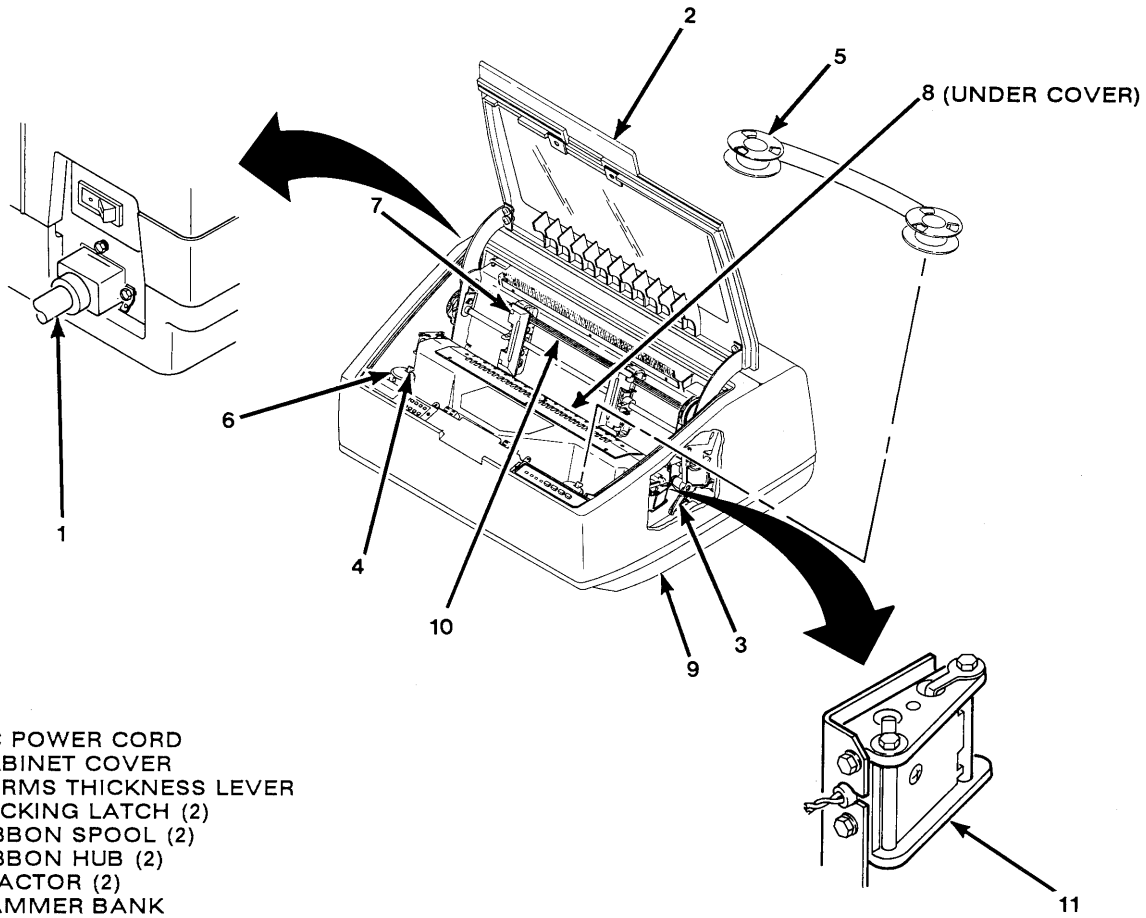
1. Wipe cabinet with clean, lint free cloth dampened (not wet) with water and mild detergent. Alternate method: spray exterior surfaces lightly with window cleaner.
2. Wipe dry with clean, lint free cloth.
3. Vacuum ventilation slots at rear of cabinet.

Table 3−2. Physical Inspection

Item	Inspection
Cabinet, Base, Structure	Check for damage, cracks, breaks, dents, gouges, scratches, de−lamination, warpage, rust, corrosion and proper finish.
Attaching Hardware	Inspect screws, bolts, nuts, washers for thread damage, rust, or corrosion.
Nameplates	Inspect for legibility and damage.
Latches and Catches (cover and shuttle)	Inspect for damage and loose or missing hardware.
Hinges	Inspect for damage and loose or missing hardware.
Electrical Connectors	Inspect for damage, bent or broken pins.
Controls and Indicators	Inspect for damage.
Window	Inspect for breaks, cracks, or discoloration.
Ribbon Cables	Inspect for broken wire or strands, damaged insulation, pinched wiring, and possible shorting conditions.
Circuit Boards	Inspect for breaks, warpage, evidence of overheated components.
Fan and Motors	Inspect for obvious damage.
Bumpers	Inspect for unusual wear. If cracked, chipped, or worn unevenly, replace per paragraph 5−33.

b. Interior of Cabinet (Figure 3−1)

1. Disconnect ac power cord (1) from printer.
2. Open cabinet cover (2).
3. Move forms thickness lever (3) to full open. Remove paper from printer.
4. Squeeze locking latch (4) and lift ribbon spools (5) from ribbon hubs (6).
5. Dislodge paper dust and ribbon lint with a soft brush. Vacuum up residue. Pay particular attention to tractor (7), hammer bank (8), and base pan (9).
6. Wipe spline shaft (10) with soft cloth.
7. Using cloth dampened with alcohol, clean ribbon guides (11) at each side of cabinet.



1. AC POWER CORD
2. CABINET COVER
3. FORMS THICKNESS LEVER
4. LOCKING LATCH (2)
5. RIBBON SPOOL (2)
6. RIBBON HUB (2)
7. TRACTOR (2)
8. HAMMER BANK
9. BASE PAN
10. SPLINE SHAFT
11. RIBBON GUIDE

Figure 3−1. Cleaning Interior of Cabinet

c. Hammer Bank Assembly (Figure 3−2)

1. Loosen two captive screws (1). Grasp shuttle cover (2) at both ends. Lift upward to free front tabs, then remove.
2. Unlock tractors (3) and move outward to sides.
3. Lift up on shuttle lock knob (4) and pull toward front of printer.
4. When shuttle assembly (5) has rotated 90 degrees to service position, release knob (4).
5. Remove paper ironer (Fig 3−3, 1) by applying pressure at its edges toward rear of printer and lifting. Wipe with alcohol dampened cloth. Press ironer (1) back into place.

❑ **CAUTION** ❑

Shuttle (5) is magnetized. This may cause some difficulty in performing the next step. Be careful not to bend cover (6).

6. Carefully lift ends of hammer bank cover (Fig 3−2, 6) from roll pins (7). Pivot cover (6) onto its rear edge to about 45 degrees, then remove.
7. Moisten clean soft cloth with alcohol. Wipe cover assembly to remove lint, ink and paper residue. Also clean holes between strips which make up cover (6).

❑ **CAUTION** ❑

Use of excessive force could disturb alignment of hammers or chip them.

8. Using stiff, non−metallic brush (such as a toothbrush) and alcohol, brush tips (8) to remove lint and ink accumulations.
9. Vacuum up any residual debris.

❑ **CAUTION** ❑

When reinstalling hammer bank cover (6), position it carefully and try to prevent the magnets from snapping it into place.

10. Position hammer bank cover (6) horizontally, slightly above hammer bank, over alignment holes adjacent to roll pins (7).
11. Gently lower cover (6), steering it into place.

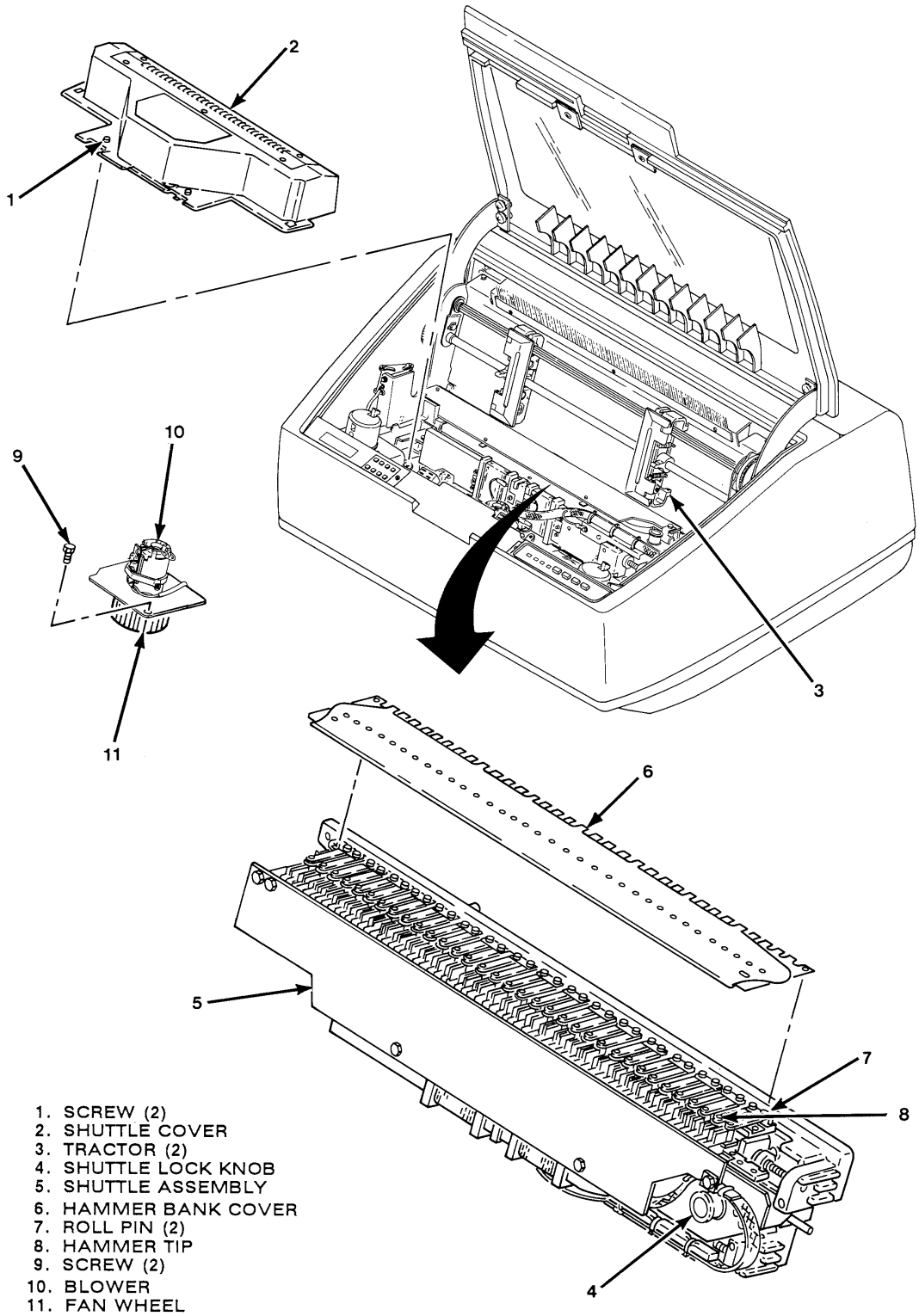


Figure 3−2. Cleaning Hammer Bank Assembly

c. Hammer Bank Assembly−continued

12. Pull out shuttle lock knob (4) and rotate shuttle to operating position. Release knob.
13. Remove two screws (9). Lift blower (10) to expose fan wheel (11). Brush wheel (11) to loosen dirt. Vacuum up residue. Return blower (10) to position. Install two screws (9).
14. Grasp shuttle cover (2) with both hands. Slide tabs at front of cover into slots at front of printer. Press down on cover (2) until it snaps into position. Tighten two captive screws (1).
15. Close cabinet cover.

d. Fan (Figure 3−4).

1. Remove cabinet per paragraph 5−15a.
2. Loosen three screws (1) and remove EMI shield cover (2).

   NOTE; Now is a good time to check paper feed timing belt per paragraph 3−5.

3. Vacuum fan (3) to remove paper, lint, and chaff.
4. Install EMI shield cover (2) and tighten three screws (1).
5. Install cabinet per paragraph 5−15b.

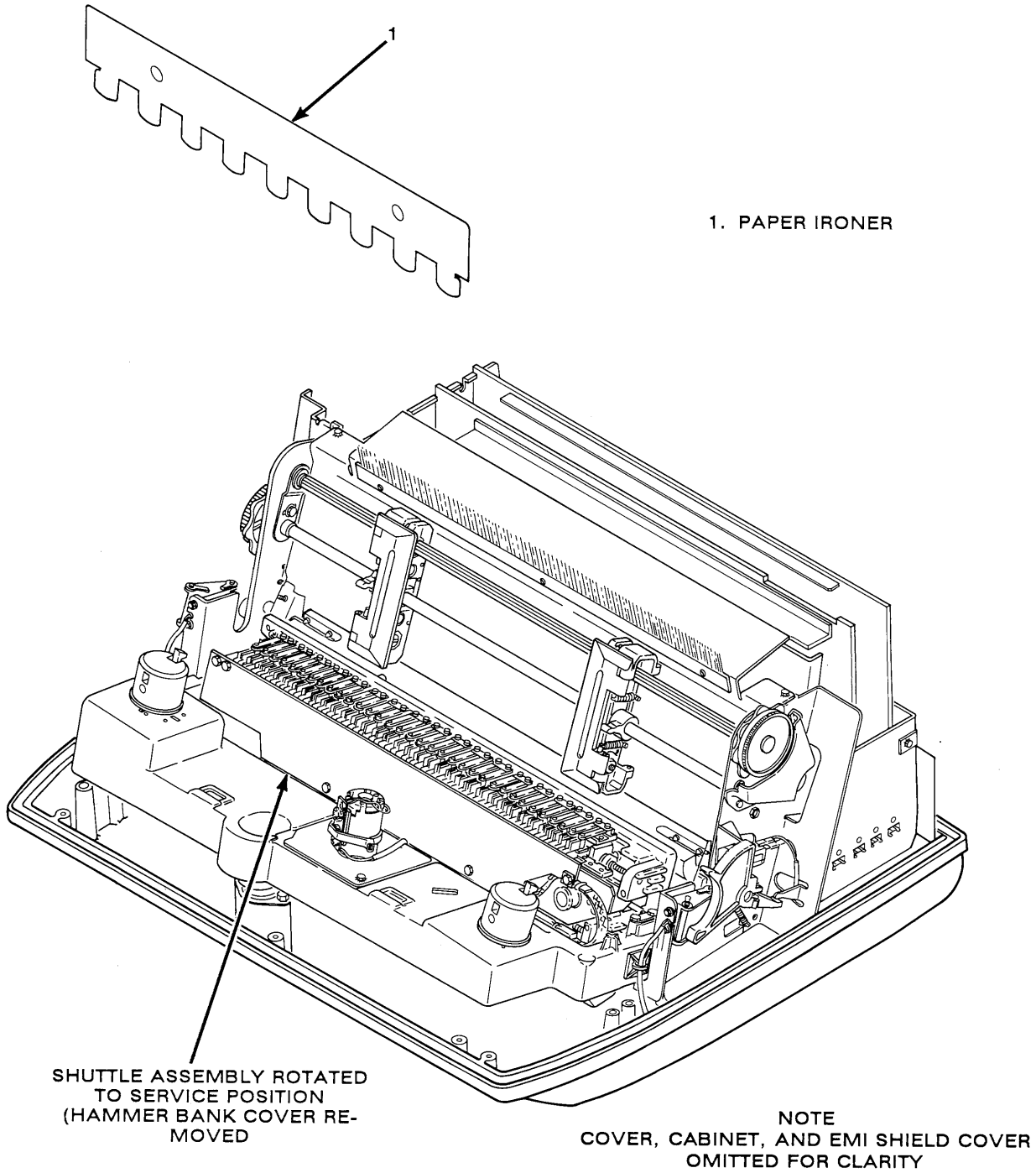
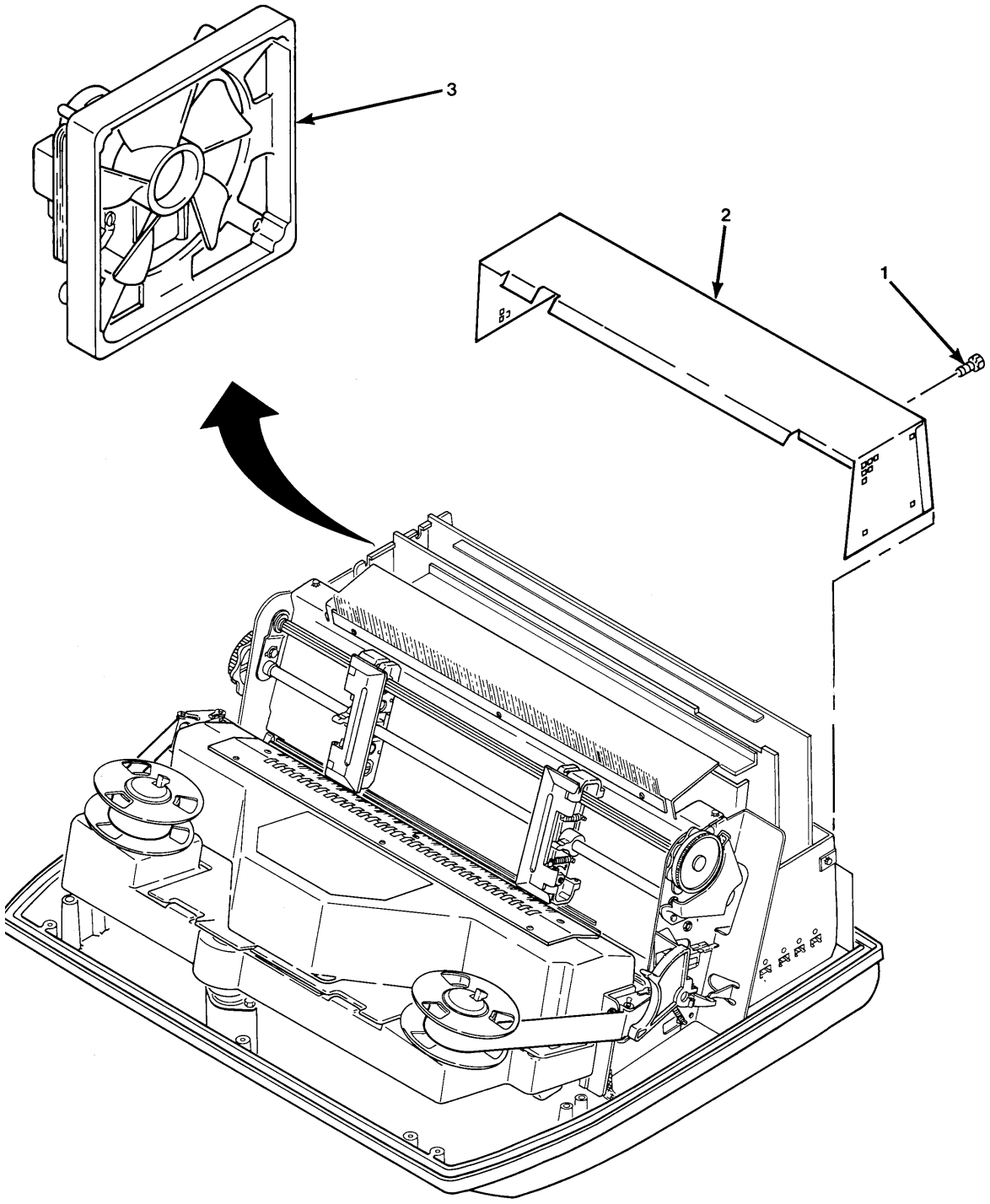

1
1. PAPER IRONER
SHUTTLE ASSEMBLY ROTATED TO SERVICE POSITION (HAMMER BANK COVER REMOVED
NOTE
COVER, CABINET, AND EMI SHIELD COVER OMITTED FOR CLARITY

Figure 3−3. Cleaning Paper Ironer



1. SCREW (3)
2. EMI SHIELD COVER
3. FAN

Figure 3−4. Cleaning Fan

3−5. Paper Feed Belt Tension Check (Figure 3−5)

1. Remove cabinet per paragraph 3−4d steps (1) through (3).
2. Remove two screws (1).
3. Separate belt shield (2) from right side plate (3).
4. Depress center of upper span of belt (4) with finger. Ideal deflection is 1/16−inch. If tension is incorrect adjust per paragraph 5−9.
5. Place belt shield (2) against right side plate (3).
6. Install two screws (1).
7. Replace cabinet per paragraph 5−15, a and b.

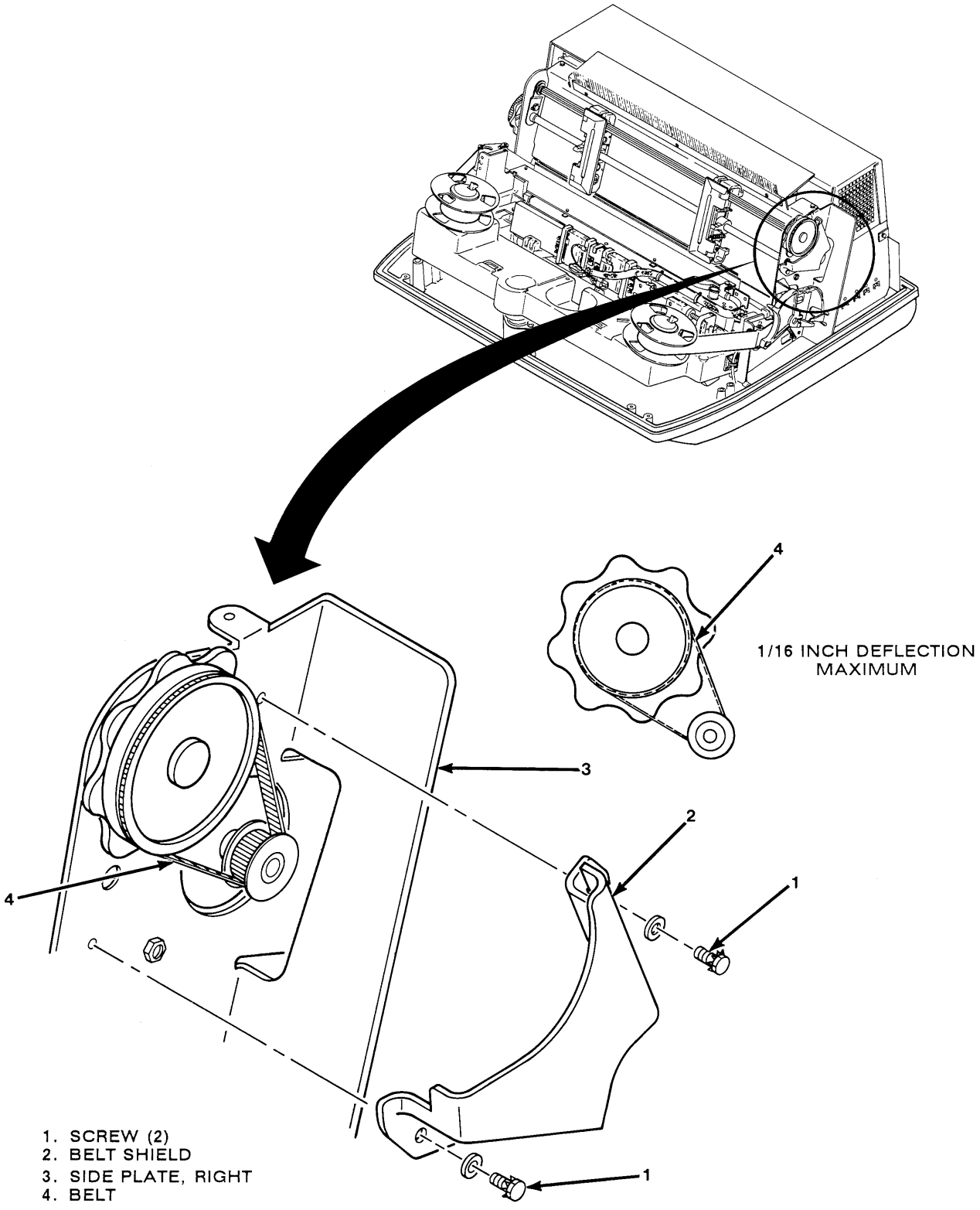


Figure 3−5. Paper Feed Belt Tension Check

CHAPTER 4

TROUBLESHOOTING

4−1. General

This chapter provides procedures to fault isolate to field replaceable units. A working knowledge of the P3000 Operator's Guide and the P3000 User's Reference Manual is required to perform fault isolation procedures contained in this manual.

4−2. Common Causes of Malfunctions

Improper printer operation may be caused by electronic failures, mechanical failures, or interface problems. Many problems can be corrected by replacing one of the PCBAs. Other problems associated with poor print quality can be cleared up by adjusting hammer alignment, platen gap, shuttle turnaround time, or belt tension. The remaining problems can be attributed to particular assemblies of the printing mechanism, or occasionally, to cables or interconnecting PCBAs.

4−3. Internal Testing

a. Self Test.

The printer continuously monitors some of its own functions. When a problem develops, fault indications appear on the indicators and digital display. A summary of these indications is presented in Table 4−1.

b. Supplemental Tests.

The printer is capable of conducting additional tests which can be used to evaluate its performance. These tests, which are summarized in Table 4−2, are useful as an aid to troubleshooting. For specific procedures, refer to User's Reference Manual.

4−4. Fault Isolation

Failures are divided into catagories as listed in the malfunction symptom index, Table 4−3. To fault isolate, locate your symptom in the table. The table will direct you to a flow chart which will guide you through the correct troubleshooting procedure. Note that these flow charts do not take multiple failures into consideration.

Table 4−1. Fault Codes

CHECK Indicator	Display Readout (FAULT CONDITION)	Operator Correctable	Description
Flashing	PAPER OUT	Yes	Paper out
Flashing	PLATEN OPEN	Yes	Platen open or shuttle cover off
Flashing	PAPER JAM	Yes	No paper motion (PMD option)
Flashing	SHUTTLE JAM	Yes	Shuttle jammed
Flashing	SHUTTLE STALL	Yes	Shuttle not up to speed
Steady	DCU RAM	No*	DCU data RAM pattern check
Steady	FONT PROM	No*	Primary font PROM check sum
Steady	MCU RAM	No*	MCU data RAM pattern check

* Indicates Soft Fault.

Table 4−2. Supplimental Tests

TEST		COMMENTS
PRINT TESTS		
Configuration	a	Configuration printout including part numbers of each installed PROM and font.
	b	Printout of each installed character set in− cluding font part number.
Repeating Tests		
	a	All “E” repeating
	b	“E” plus TOF
	c	All “H” repeating
	d	Shift recycle
	e	All underlines repeating
	f	Black plot
	g	Shuttle/Ribbon
	h	Print sampler
SERVICE AIDS		
Rebound Index		Motor bar and hammer bank rebound index dis− played. Shuttle operates without printing.
Stroke Time		Average stroke time displayed in xx.x milliseconds.
Phasing Index		Capability is provided to display an index number which represents the hammer phas− ing index.

Continued

Table 4−3. Malfunction Symptom Index

Malfunction Symptom	Flowchart Figure No.
I. CONTROL PANEL INDICATORS, SWITCHES, AND DISPLAYS OPERATE IMPROPERLY.	
Whenever power is applied to the printer, all indicators on both panels should light for about two seconds while the printer runs self−check: then, all indicators except ONLINE should extinguish. ONLINE should flash (offline) or come on and stay on (online).	
a. All indicators come on and stay on at power−up.	4−1
b. No indicators come on at power−up.	4−2
c. Indicators on both control panels operate improperly.	4−3
d. Switches or indicators operate improperly on front panel only.	4−4
e. Digital display operates improperly.	4−5
II. CHECK INDICATOR COMES ON.	
When the CHK indicator lights, an accompanying fault message can be expected on the digital display.	
a. CHECK Indicator Flashes, Display Shows: FAULT CONDITION	
1. PAPER OUT	4−6
2. PLATEN OPEN	4−7
3. PAPER JAM	4−9, 4−10
4. SHUTTLE JAM	4−17
5. SHUTTLE STALL	4−18
b. CHECK Indicator on Continuously. Display shows: FAULT CONDITION	
1. DCU RAM, FONT PROM, or MCU RAM	4−8

Continued

Table 4−3. Malfunction Symptom Index−continued

Malfunction Symptom	Flowchart Figure No.
III. PAPER TRANSPORT NOT FEEDING PROPERLY. Paper motion and EVFU tests shown below may be useful in accessing paper feed problems:	
a. Paper Doesn't Feed at All.	4−9
b. Paper Feeds Erratically or Jams.	4−10
c. Paper Drags.	4−11
d. Set Top of Form Not Operating.	4−12
IV. RIBBON TRANSPORT FEEDS IMPROPERLY. Before proceeding, verify ribbon is positioned correctly in hammer bank cover, spools are pushed all the way down and latch has seated above spool, and that ribbon is tracking properly in guides.	
a. Ribbon Does Not Move at All.	4−13
b. Ribbon Folds Over.	4−14
c. Ribbon Does Not Run Smoothly.	4−15
d. Ribbon Does Not Change Direction at End.	4−16
V. SHUTTLE MOVEMENT NOT NORMAL.	
a. Shuttle Does Not Move at All.	4−17
b. Shuttle Jams or Moves Too Slowly.	4−18
c. Shuttle Moves Erratically.	4−19
d. Shuttle Movement Produces Knocking Sound.	4−20

Continued

Table 4−3. Malfunction Symptom Index−continued

Malfunction Symptom	Flowchart Figure No.
VI. PRINTER DOES NOT PRINT PROPERLY.	
a. Printer Does Not Print at All.	4−21
b. Printer Fails to Print Only When Controlled by Host Computer.	4−22
c. Characters Missing (see Fig 4−23 for example).	
1. Characters Missing Consistently	4−24
2. Characters Missing Randomly	4−25
d. Missing Dots (see Fig 4−26 for example).	
1. Consistent Dropout of Dots	4−27
2. Random Dropout of Dots	4−28
e. Character Positions Light or Smeared (see Fig 4−29 for example).	4−30
f. Dots Misplaced.	4−31
g. Improper Print Density (see Fig 4−32 for example).	4−33
h. Improper Horizontal or Vertical Alignment (see Fig 4−34 and 4−35 for examples).	4−36
i. Characters Misformed Vertically (see Fig 4−37 for example).	4−38
j. Erratic Character Height See −− Paper Feeds Erratically.	4−10
k. Compacted Print (see Fig 4−39 for example). See also −− Paper Feeds Erratically.	4−40 4−10
l. Garbled Print and/or Incorrect Font.	4−41
VII. BLOWER MOTOR NOT OPERATING	4−43

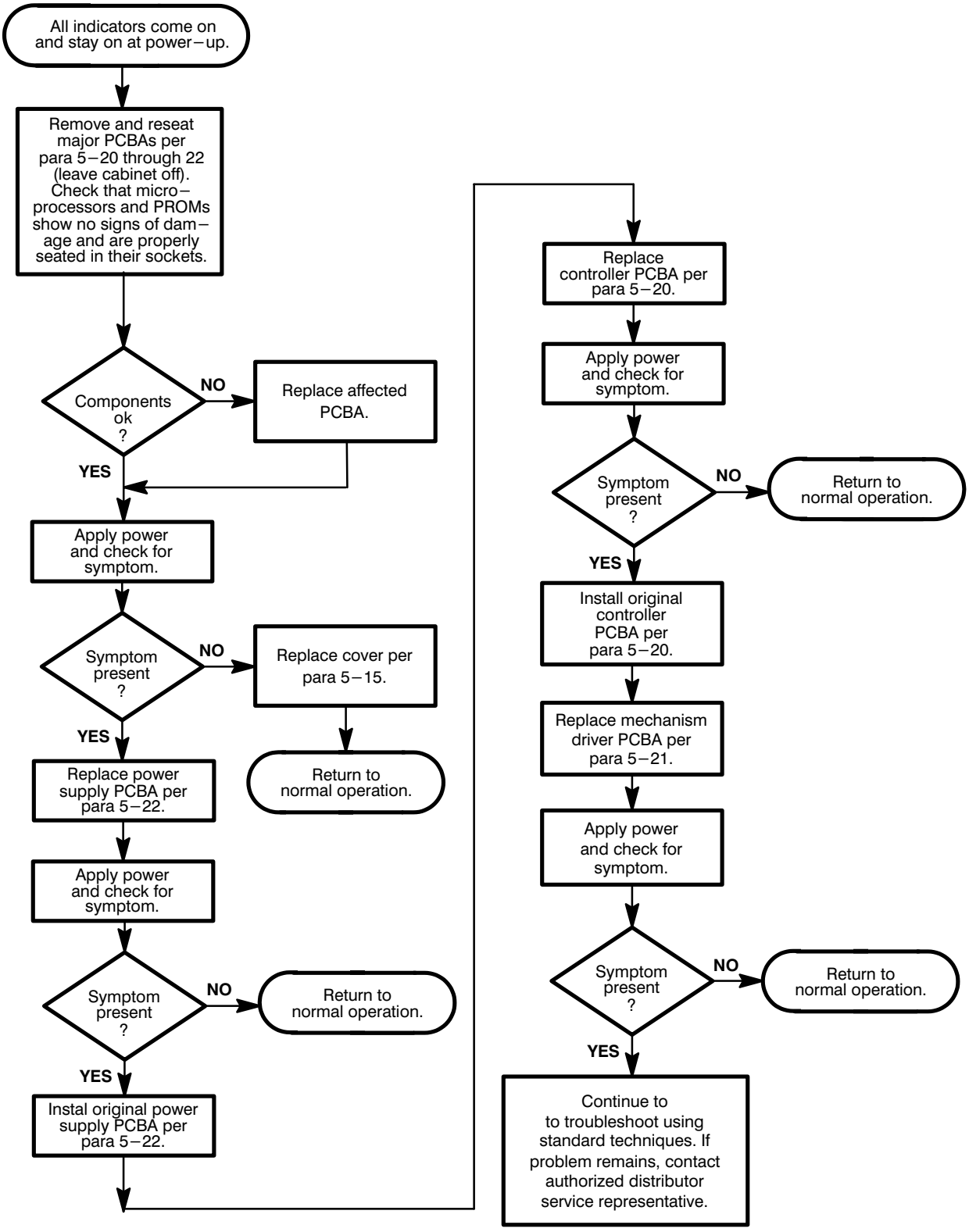

All indicators come on and stay on at power−up.
Remove and reseat major PCBAs per para 5−20 through 22 (leave cabinet off). Check that micro−processors and PROMs show no signs of dam−age and are properly seated in their sockets.
Components ok ?
NO
Replace affected PCBA.
YES
Apply power and check for symptom.
Symptom present ?
NO
Replace cover per para 5−15.
Return to normal operation.
YES
Replace power supply PCBA per para 5−22.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Instal original power supply PCBA per para 5−22.
Replace controller PCBA per para 5−20.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Install original controller PCBA per para 5−20.
Replace mechanism driver PCBA per para 5−21.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Continue to to troubleshoot using standard techniques. If problem remains, contact authorized distributor service representative.

Figure 4−1. All Indicators Come on and Stay on at Power−up

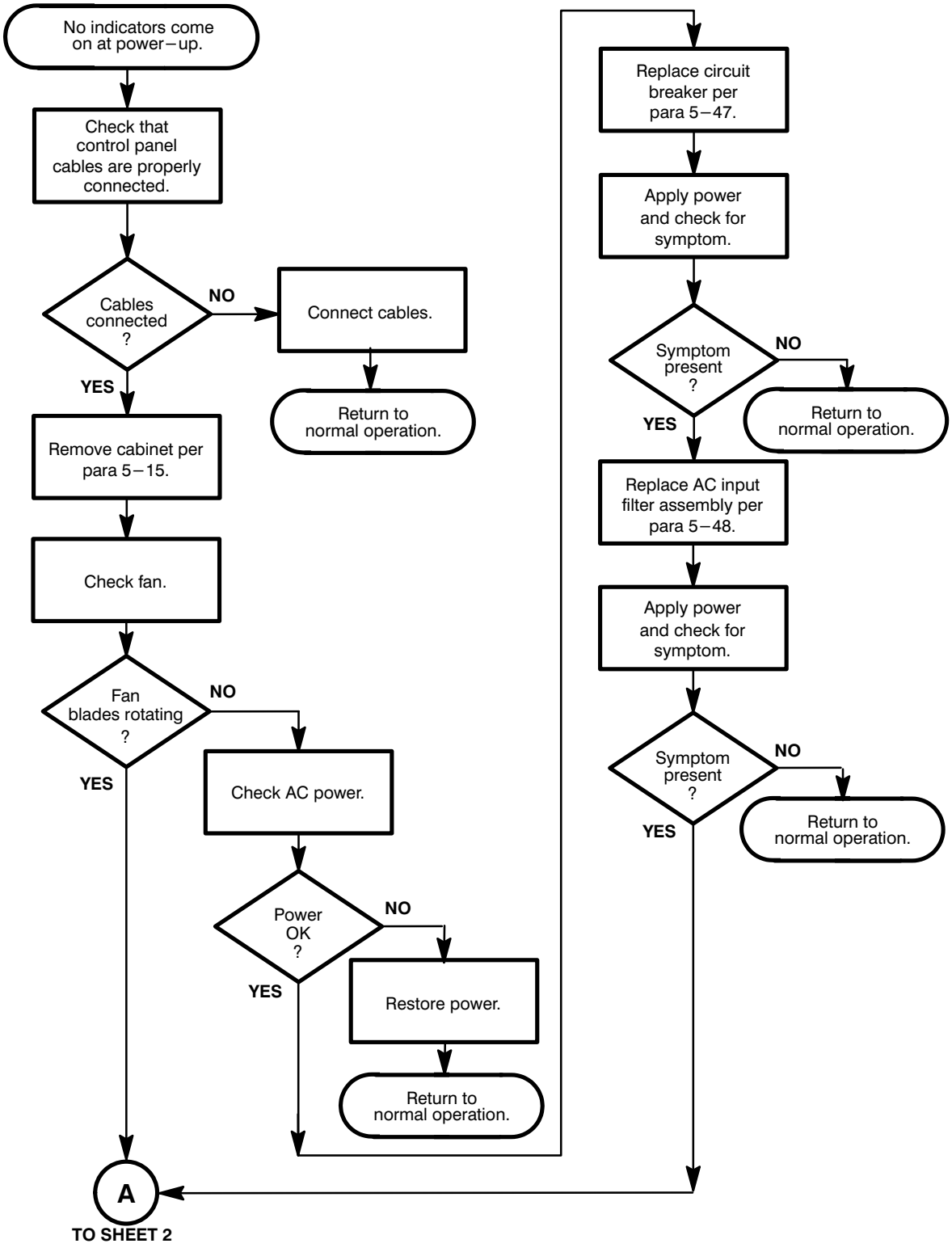


Figure 4−2. No Indicators Come on at Power−up (Sheet 1 of 3)

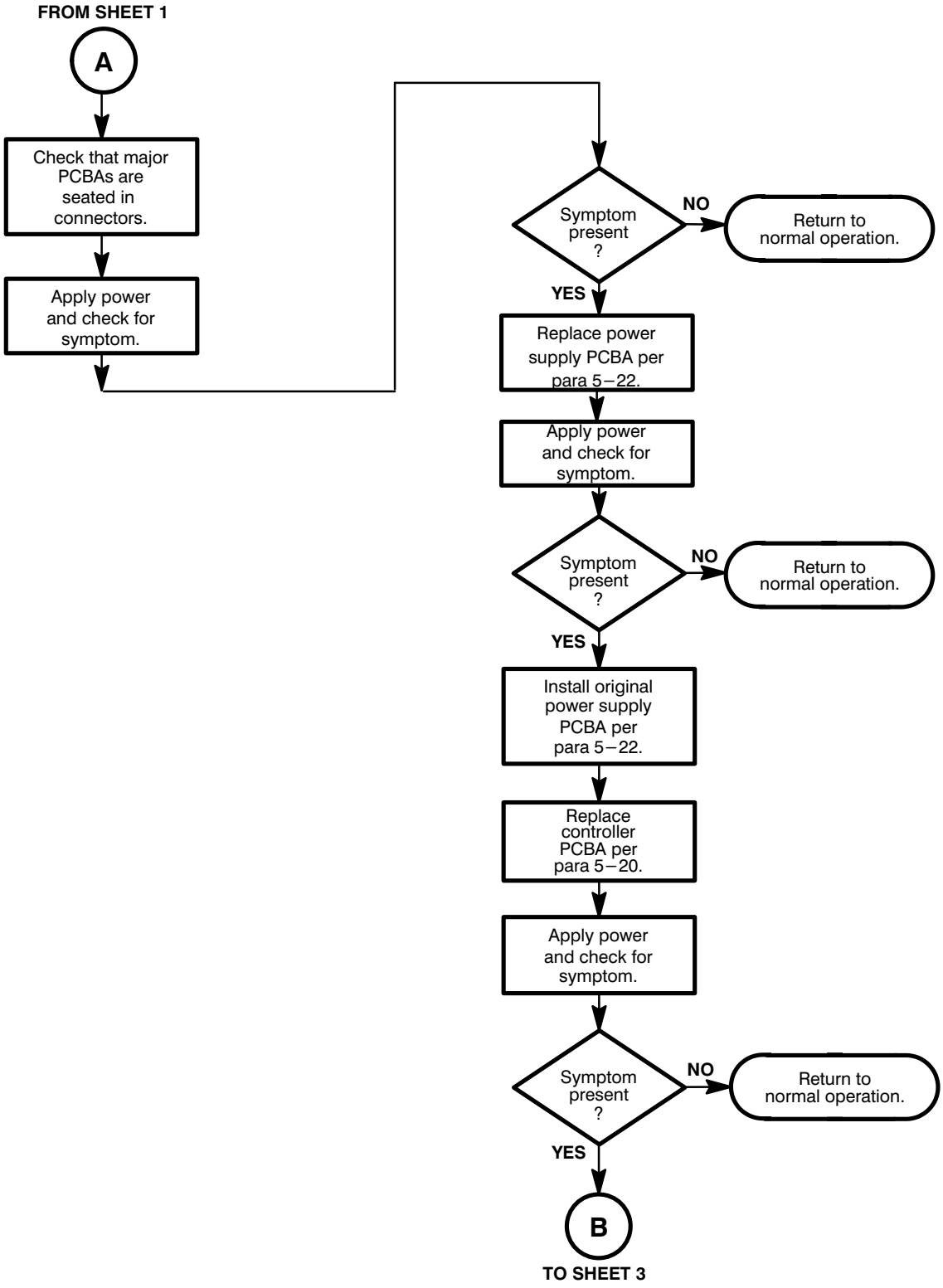


Figure 4−2. No Indicators Come on at Power−up (Sheet 2 of 3)

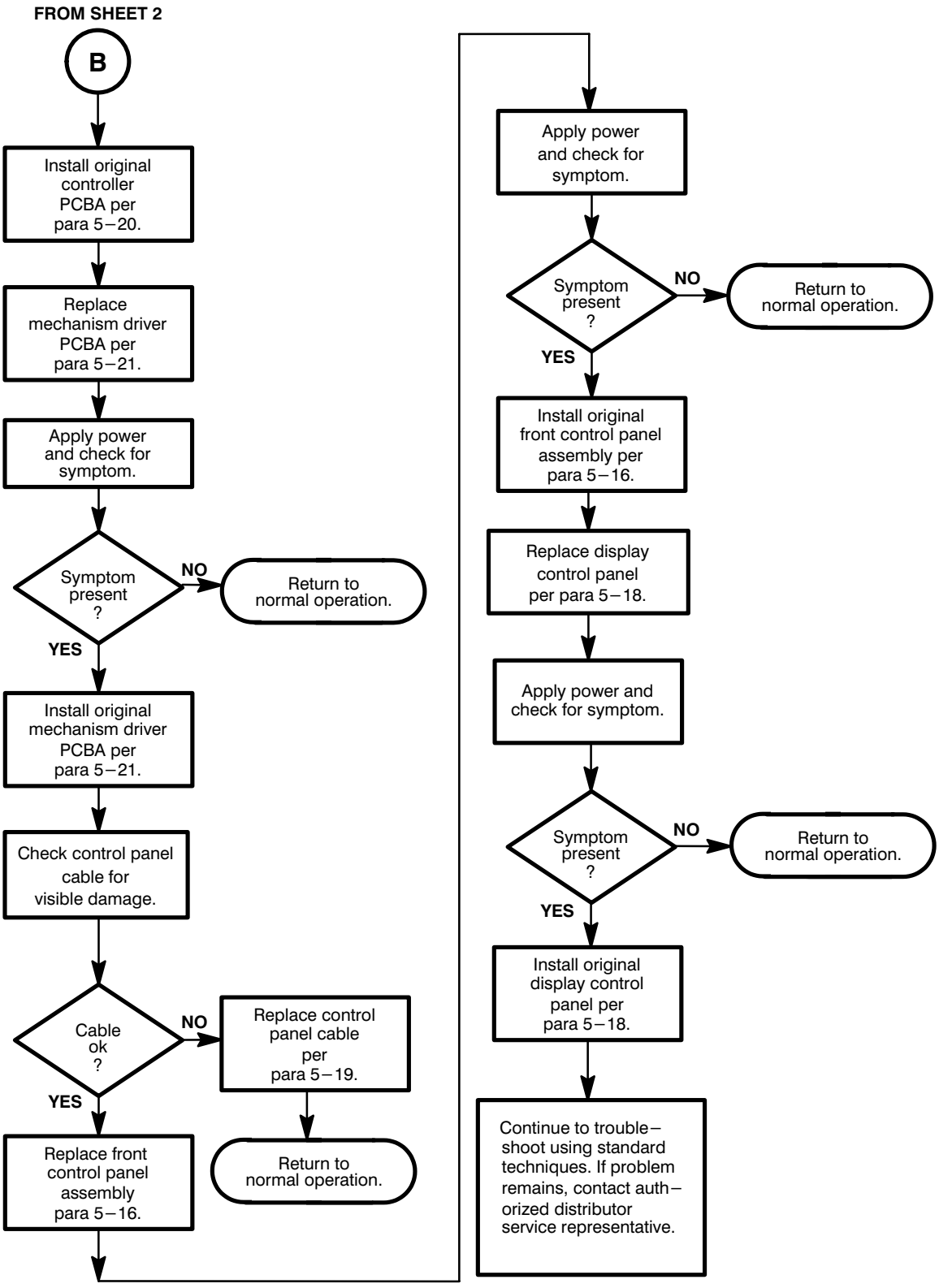

FROM SHEET 2
B
Install original controller PCBA per para 5−20.
Replace mechanism driver PCBA per para 5−21.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Install original mechanism driver PCBA per para 5−21.
Check control panel cable for visible damage.
Cable ok ?
NO
Replace control panel cable per para 5−19.
Return to normal operation.
YES
Replace front control panel assembly para 5−16.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Install original front control panel assembly per para 5−16.
Replace display control panel per para 5−18.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Install original display control panel per para 5−18.
Continue to trouble−shoot using standard techniques. If problem remains, contact auth−orized distributor service representative.

Figure 4−2. No Indicators Come on at Power−up (Sheet 3 of 3)

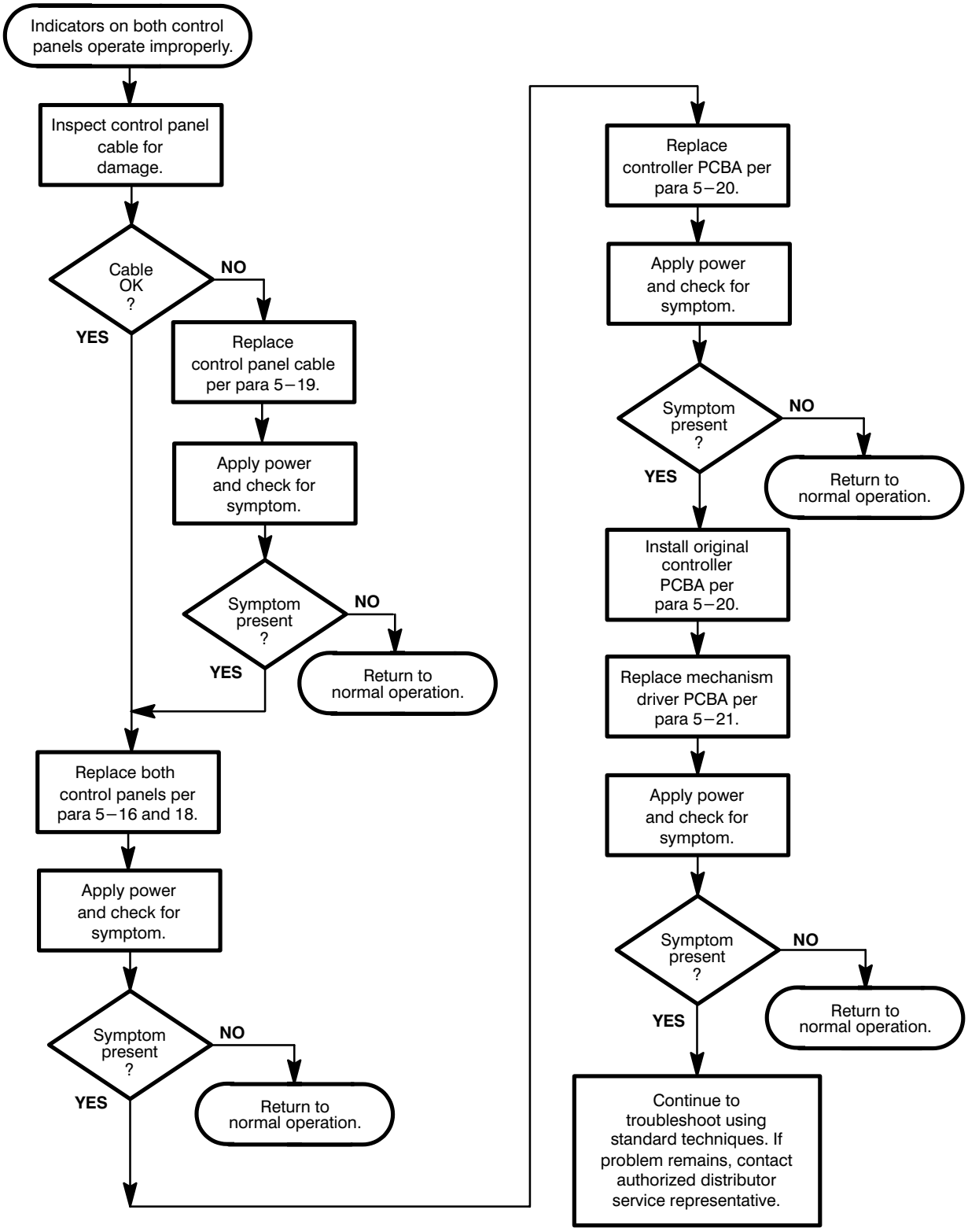

Indicators on both control panels operate improperly.
Inspect control panel cable for damage.
Cable OK ?
NO
YES
Replace control panel cable per para 5−19.
Apply power and check for symptom.
Symptom present ?
NO
YES
Return to normal operation.
Replace both control panels per para 5−16 and 18.
Apply power and check for symptom.
Symptom present ?
NO
YES
Return to normal operation.
Replace controller PCBA per para 5−20.
Apply power and check for symptom.
Symptom present ?
NO
YES
Return to normal operation.
Install original controller PCBA per para 5−20.
Replace mechanism driver PCBA per para 5−21.
Apply power and check for symptom.
Symptom present ?
NO
YES
Return to normal operation.
Continue to troubleshoot using standard techniques. If problem remains, contact authorized distributor service representative.

Figure 4−3. Indicators on Both Control Panels Operate Improperly

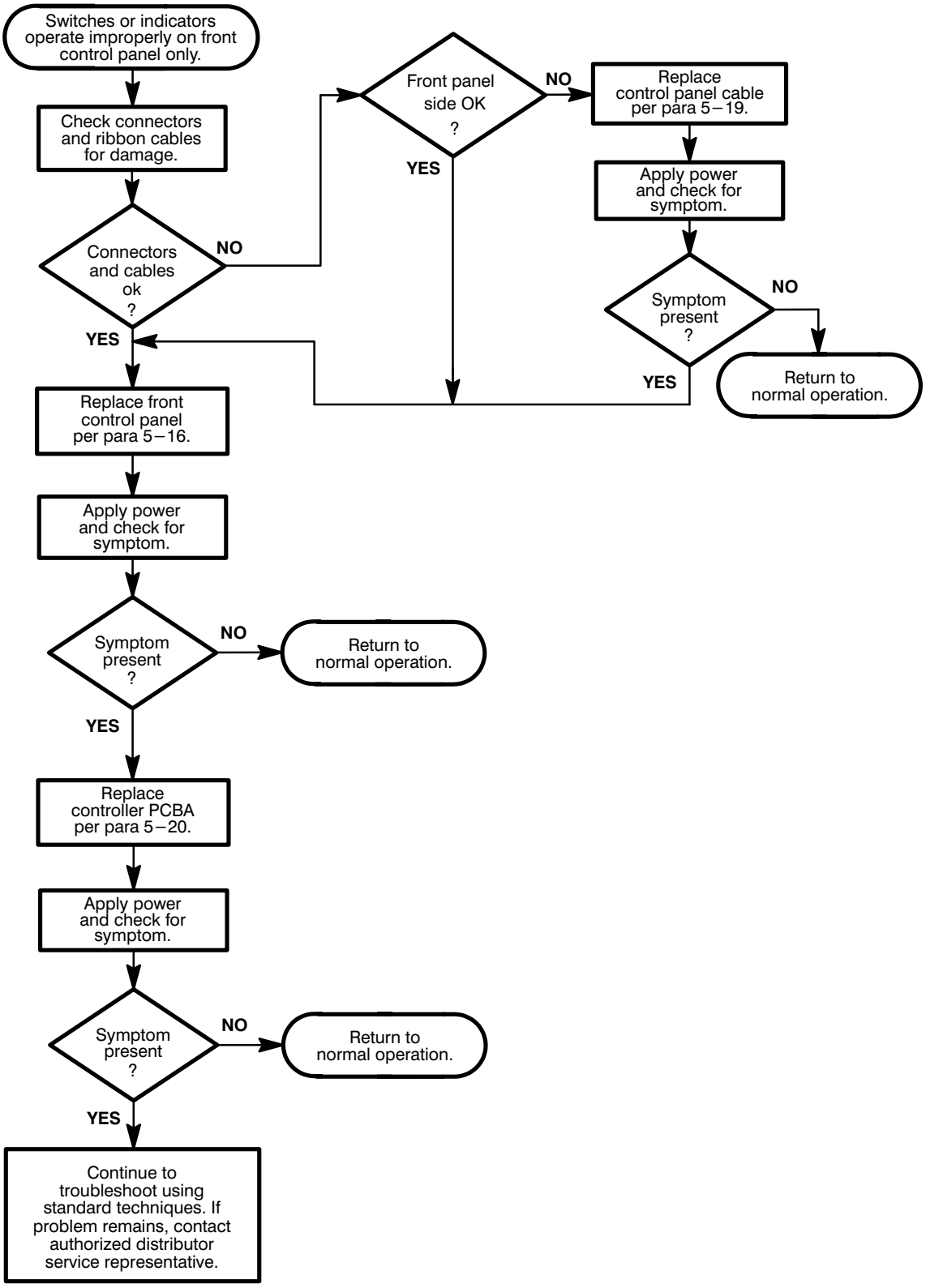

Switches or indicators operate improperly on front control panel only.
Check connectors and ribbon cables for damage.
Connectors and cables ok ?
NO
YES
Front panel side OK ?
NO
YES
Replace control panel cable per para 5−19.
Apply power and check for symptom.
Symptom present ?
NO
YES
Return to normal operation.
Replace front control panel per para 5−16.
Apply power and check for symptom.
Symptom present ?
NO
YES
Return to normal operation.
Replace controller PCBA per para 5−20.
Apply power and check for symptom.
Symptom present ?
NO
YES
Return to normal operation.
Continue to troubleshoot using standard techniques. If problem remains, contact authorized distributor service representative.

Figure 4−4. Switches or Indicators Operate Improperly on Front Control Panel Only

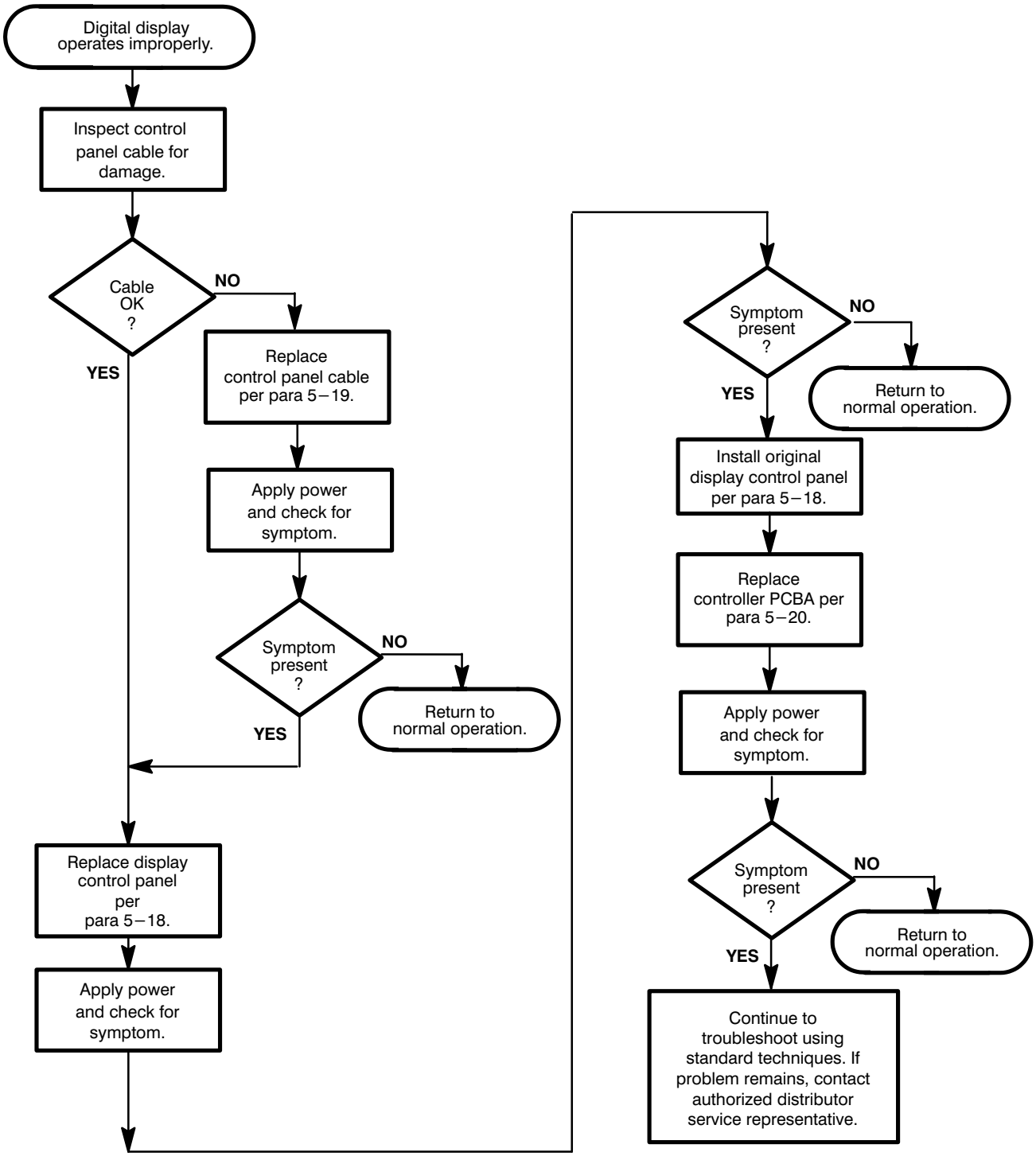

Digital display operates improperly.
Inspect control panel cable for damage.
Cable OK ?
NO
YES
Replace control panel cable per para 5−19.
Apply power and check for symptom.
Symptom present ?
NO
YES
Return to normal operation.
Replace display control panel per para 5−18.
Apply power and check for symptom.
Symptom present ?
NO
YES
Return to normal operation.
Install original display control panel per para 5−18.
Replace controller PCBA per para 5−20.
Apply power and check for symptom.
Symptom present ?
NO
YES
Return to normal operation.
Continue to troubleshoot using standard techniques. If problem remains, contact authorized distributor service representative.

Figure 4−5. Digital Display Operates Improperly

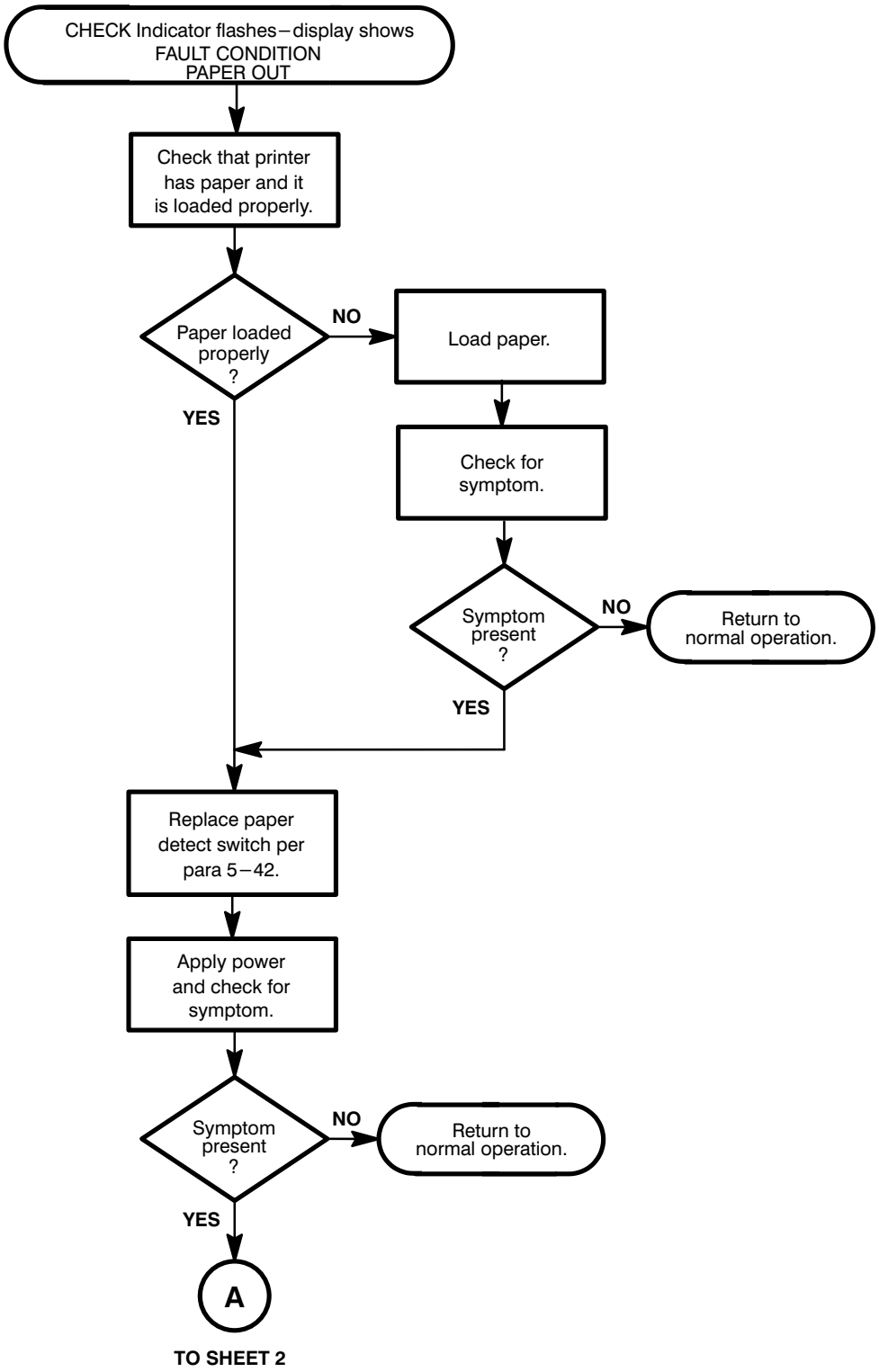


Figure 4−6. CHECK Indicator Flashes−−Display Shows FAULT CONDITION PAPER OUT (Sheet 1 of 2)

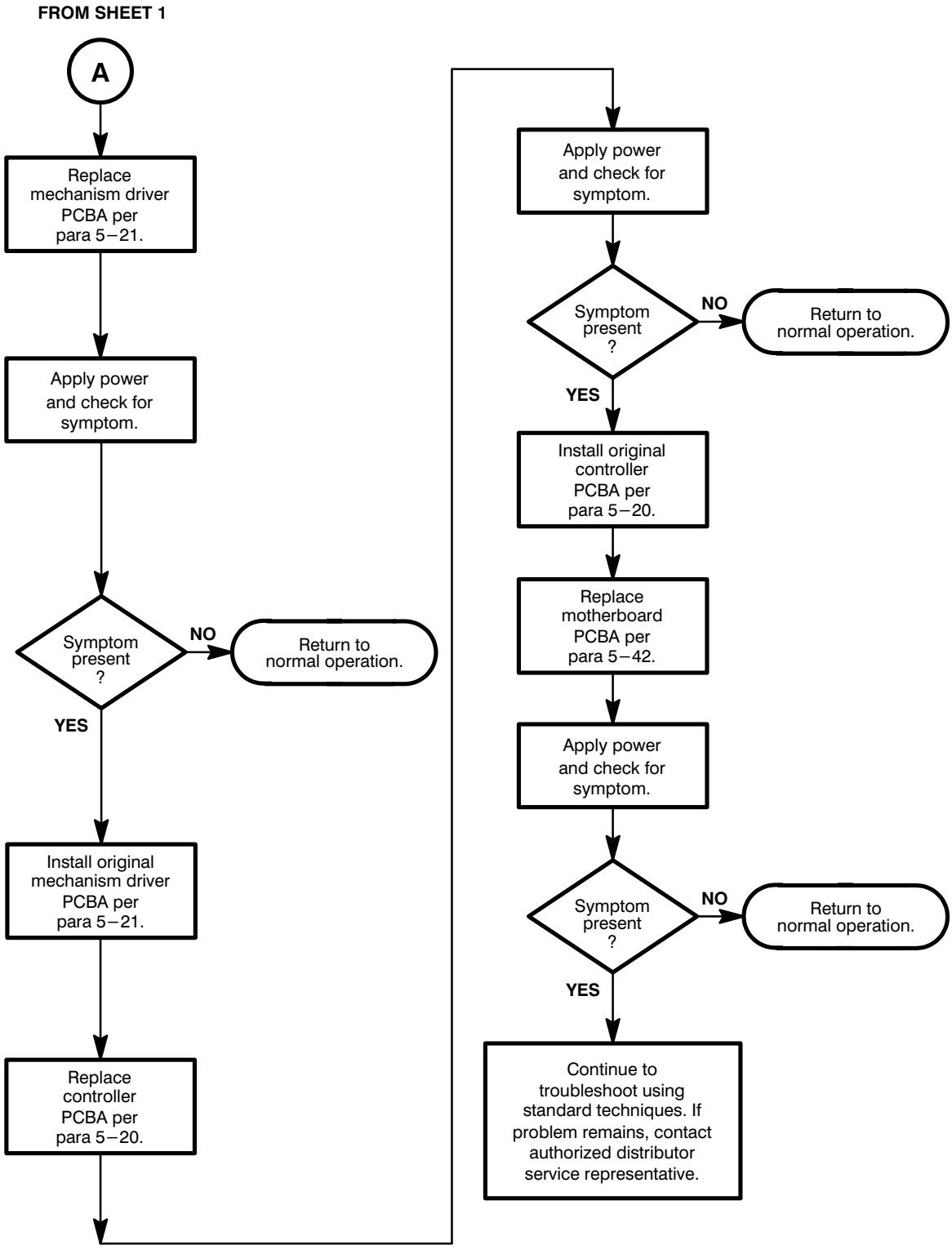

FROM SHEET 1
A
Replace mechanism driver PCBA per para 5−21.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Install original mechanism driver PCBA per para 5−21.
Replace controller PCBA per para 5−20.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Install original controller PCBA per para 5−20.
Replace motherboard PCBA per para 5−42.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Continue to troubleshoot using standard techniques. If problem remains, contact authorized distributor service representative.

Figure 4−6. CHECK Indicator Flashes−−Display Shows FAULT CONDITION PAPER OUT (Sheet 2 of 2)

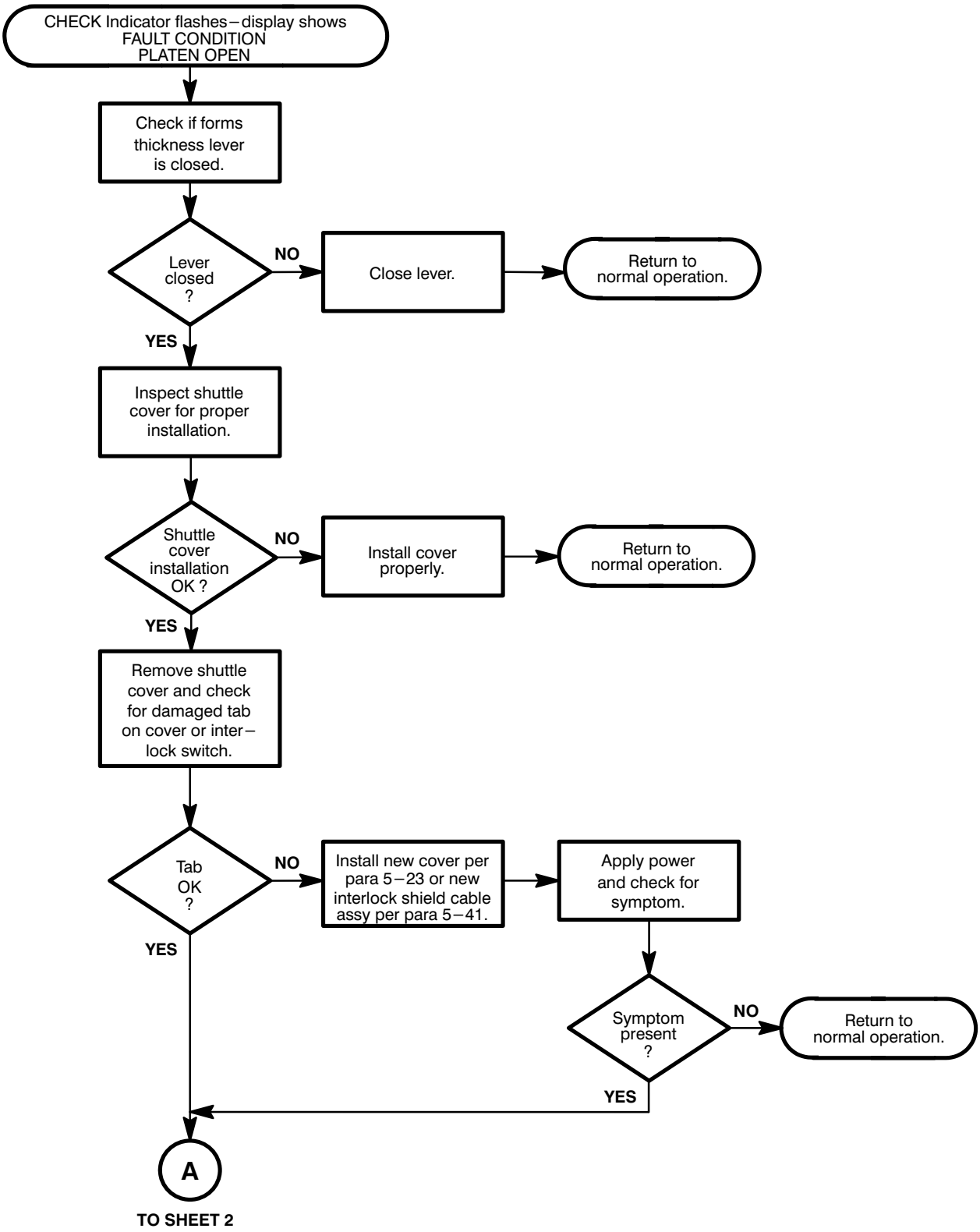


Figure 4−7. CHECK Indicator Flashes−−Display Shows FAULT CONDITION PLATEN OPEN (Sheet 1 of 2)

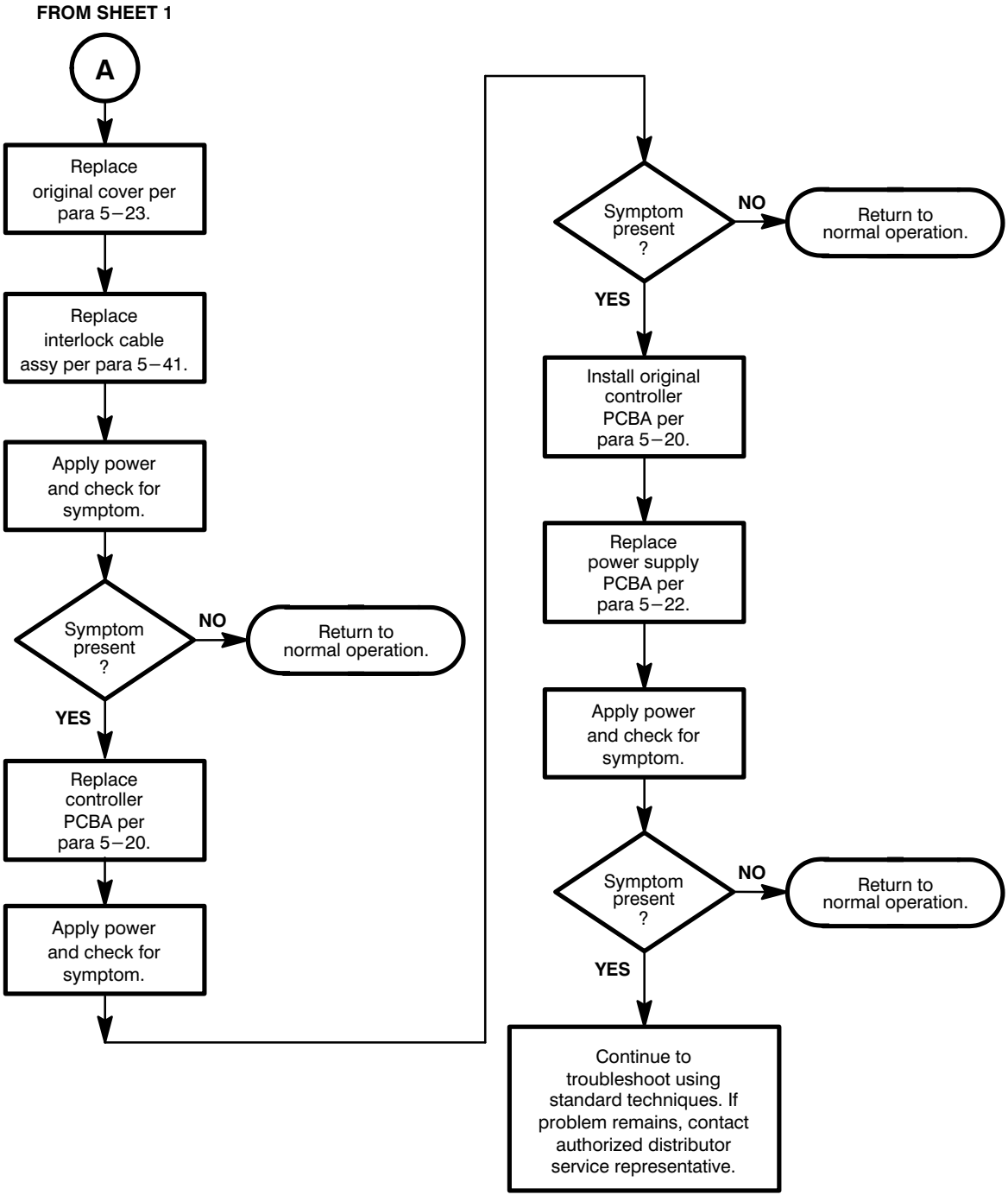

FROM SHEET 1
A
Replace original cover per para 5−23.
Replace interlock cable assy per para 5−41.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Replace controller PCBA per para 5−20.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Install original controller PCBA per para 5−20.
Replace power supply PCBA per para 5−22.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Continue to troubleshoot using standard techniques. If problem remains, contact authorized distributor service representative.

Figure 4−7. CHECK Indicator Flashes−−Display Shows FAULT CONDITION PLATEN OPEN (Sheet 2 of 2)

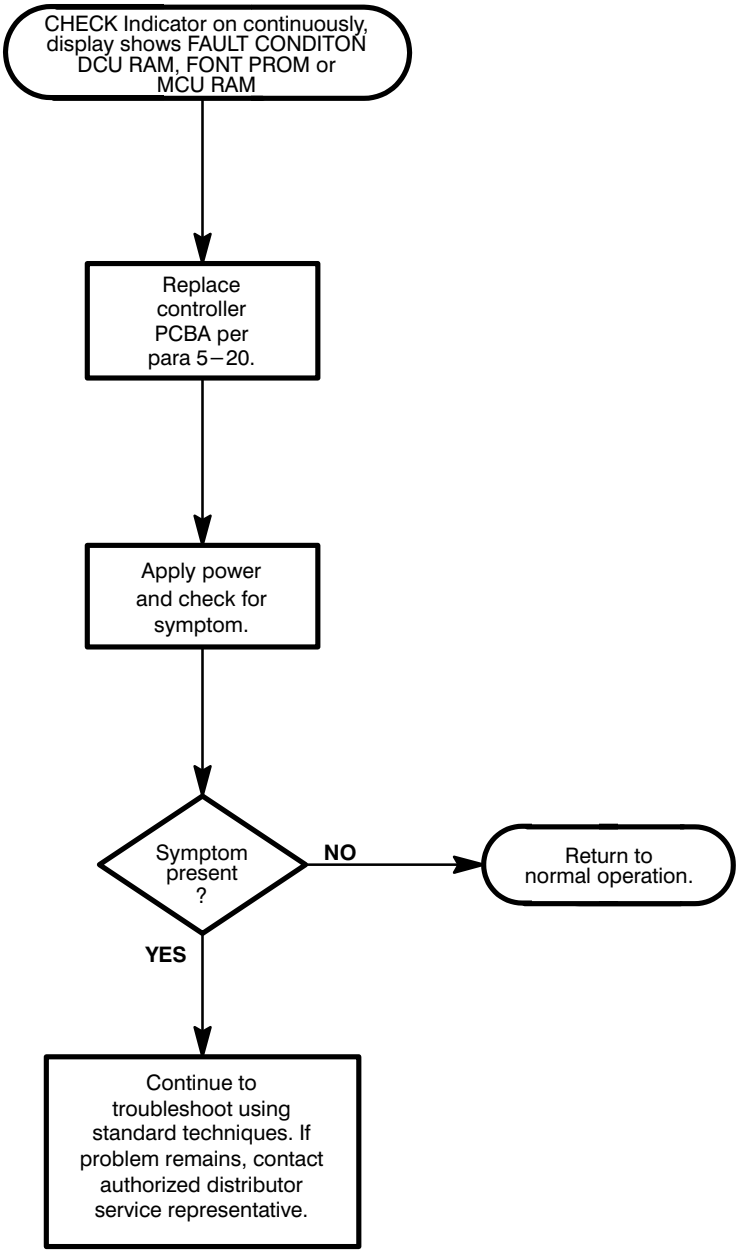

CHECK Indicator on continuously, display shows FAULT CONDITON DCU RAM, FONT PROM or MCU RAM
Replace controller PCBA per para 5−20.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Continue to troubleshoot using standard techniques. If problem remains, contact authorized distributor service representative.

Figure 4−8. CHECK Indicator on Continuously−−Display Shows FAULT CONDITION DCU RAM, FONT PROM or MCU RAM

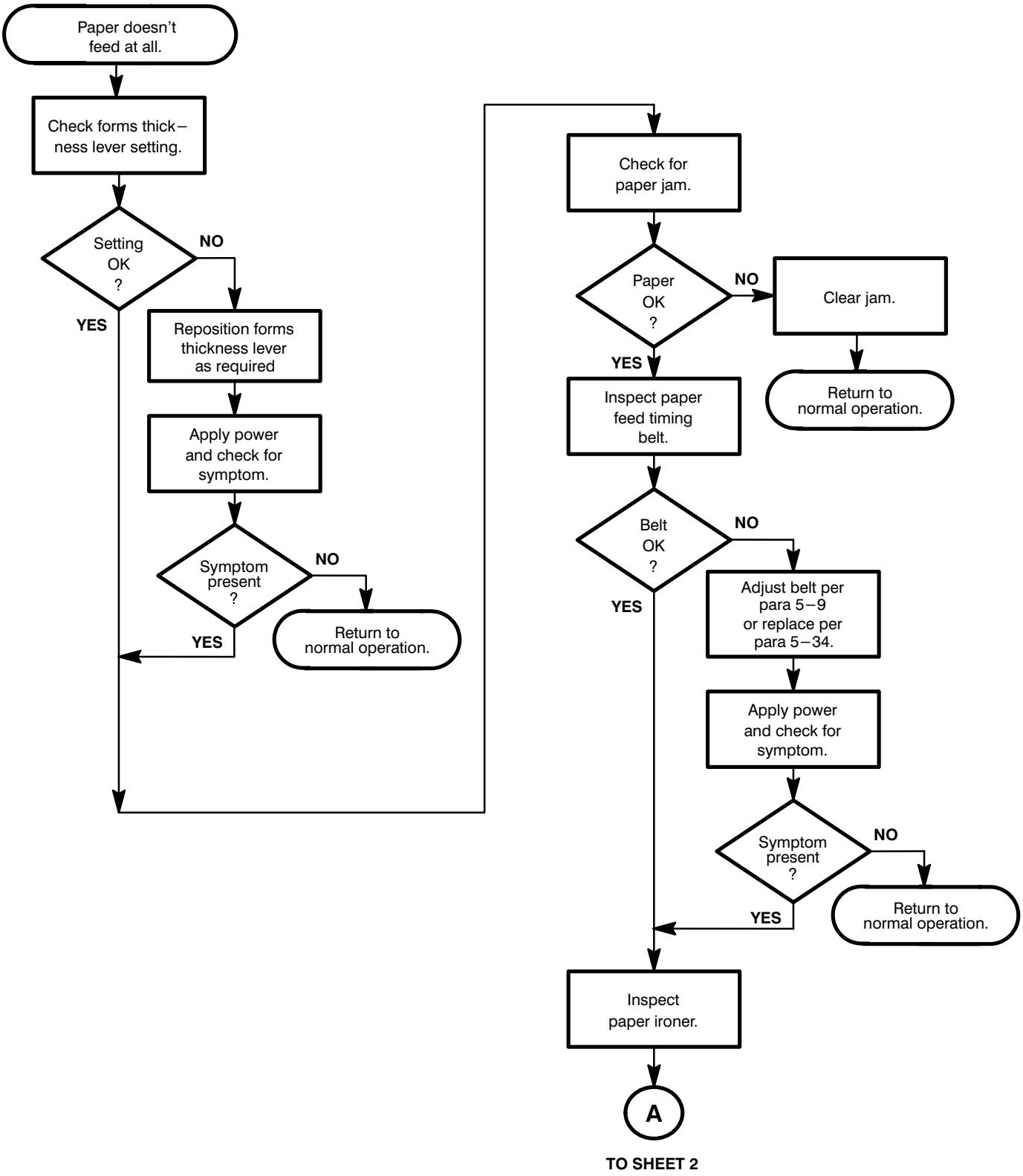


Figure 4–9. Paper Doesn't Feed at All (Sheet 1 of 3)

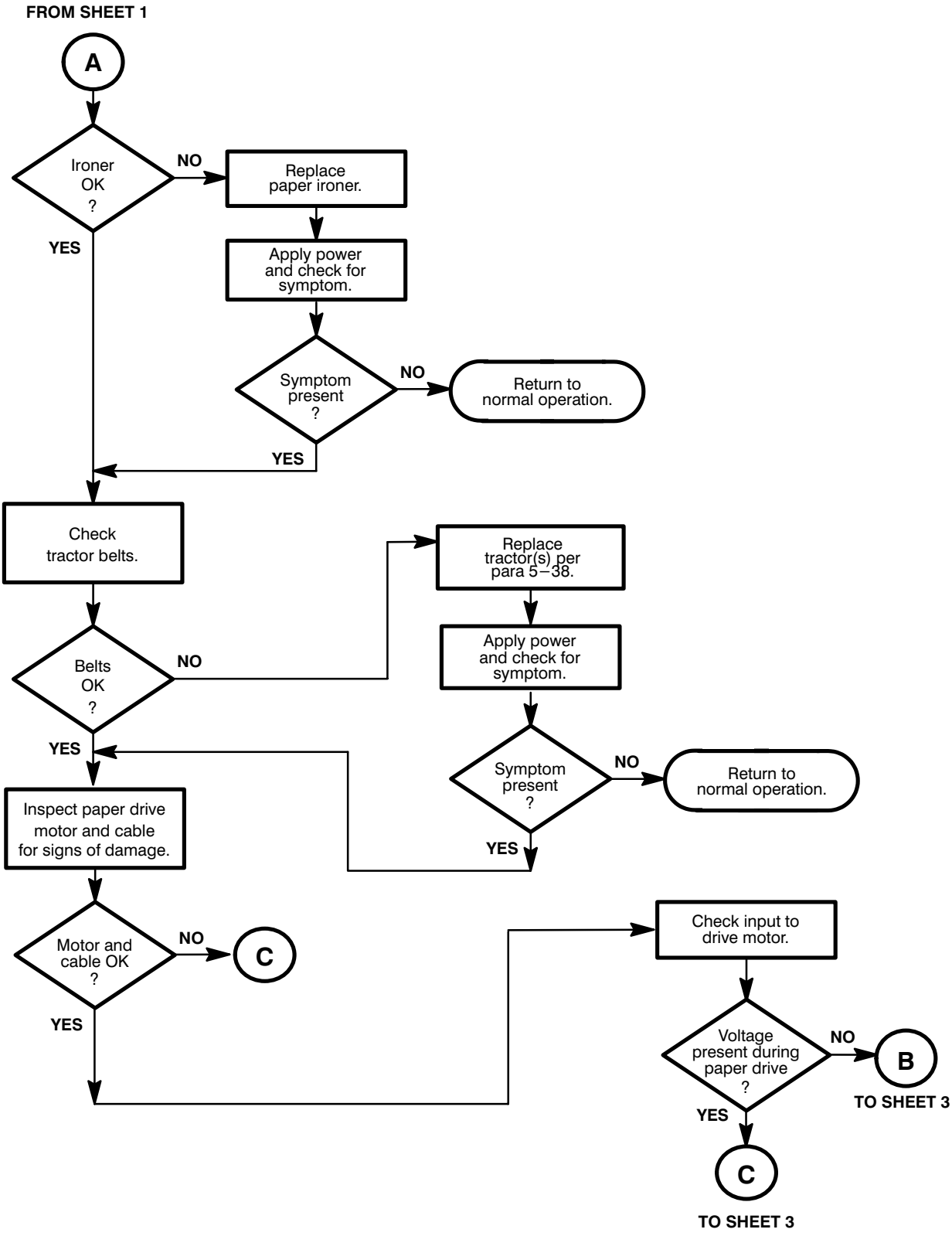


Figure 4−9. Paper Doesn't Feed at All (Sheet 2 of 3)

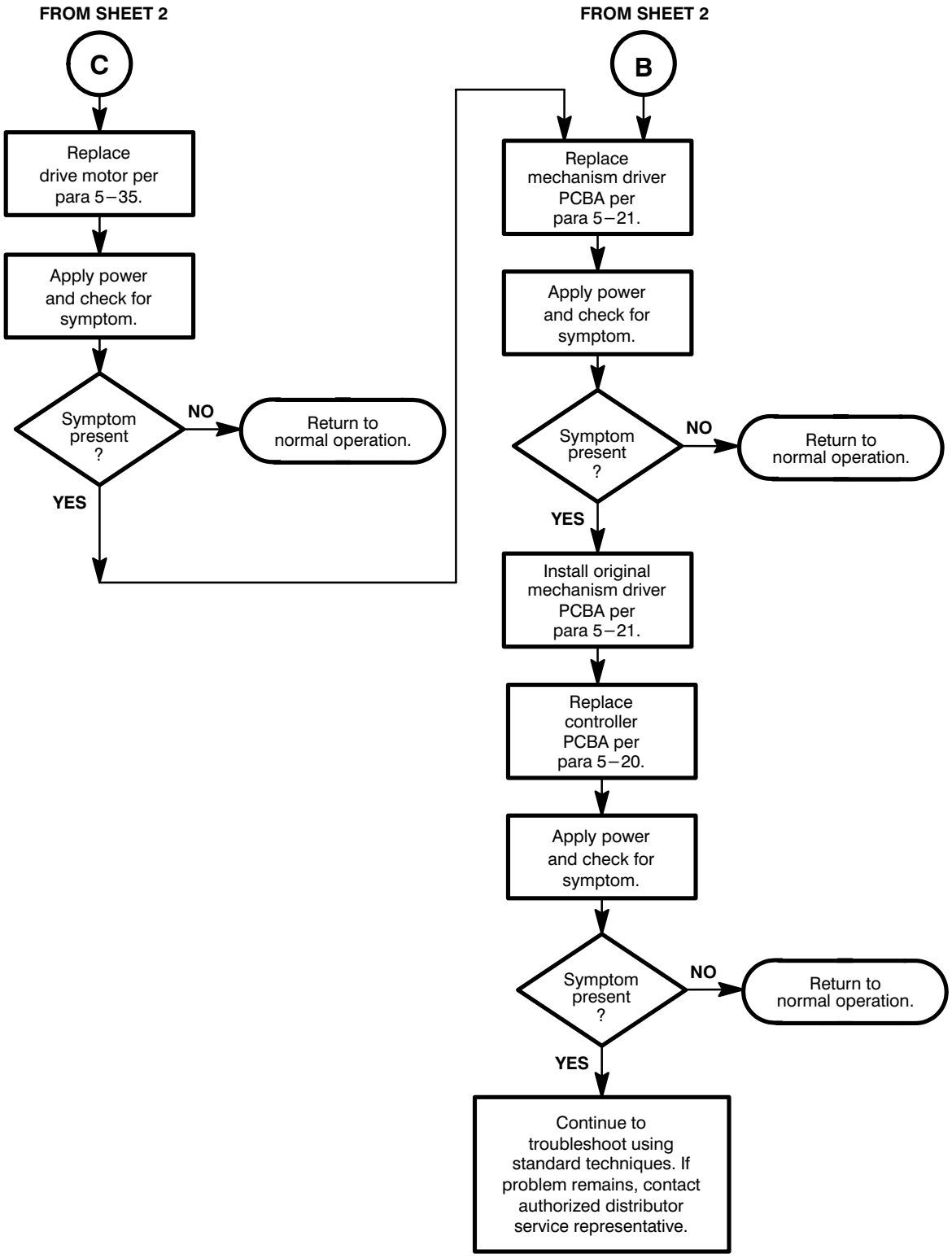


Figure 4−9. Paper Doesn't Feed at All (Sheet 3 of 3)

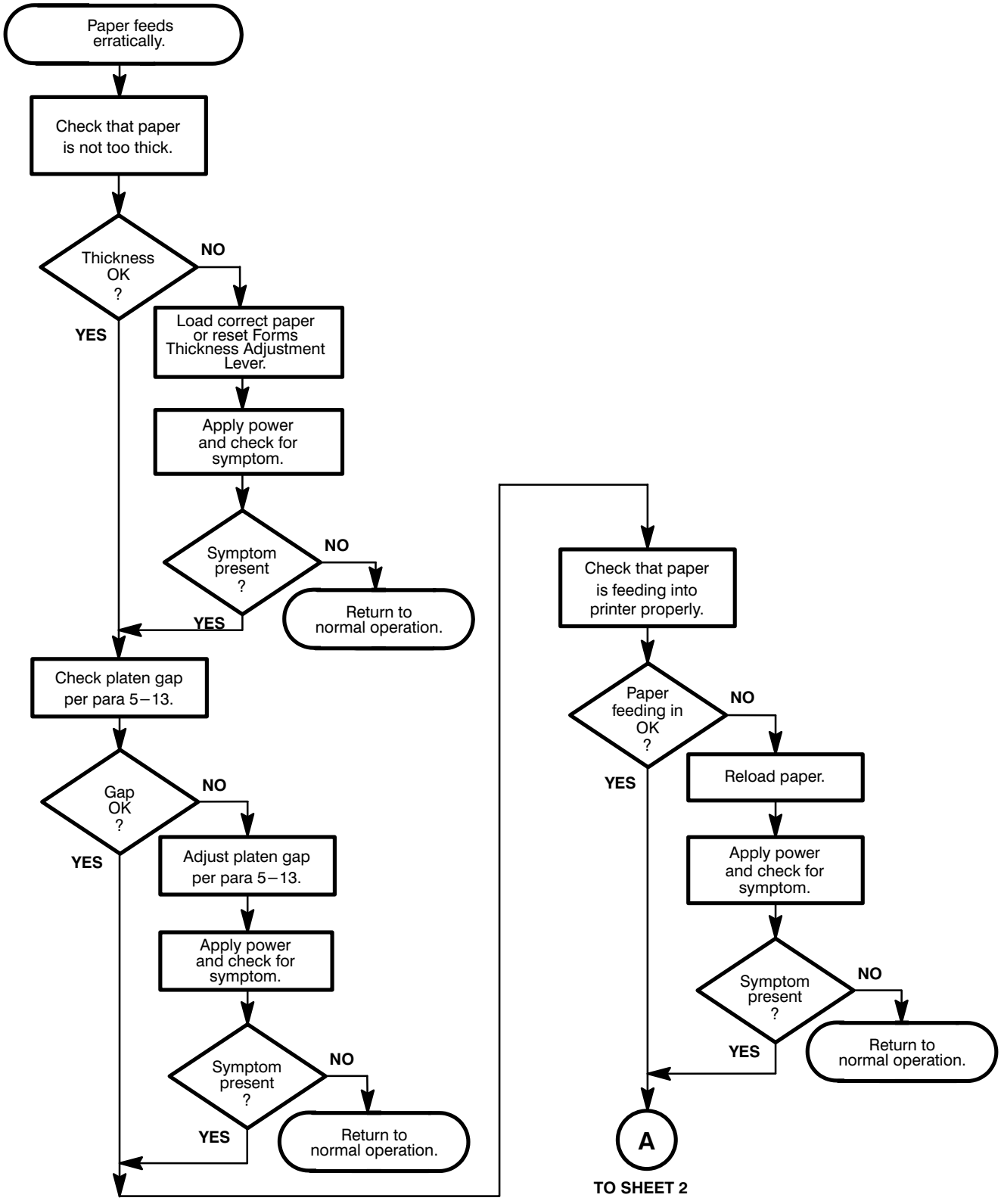


Figure 4−10. Paper Feeds Erratically (Sheet 1 of 4)

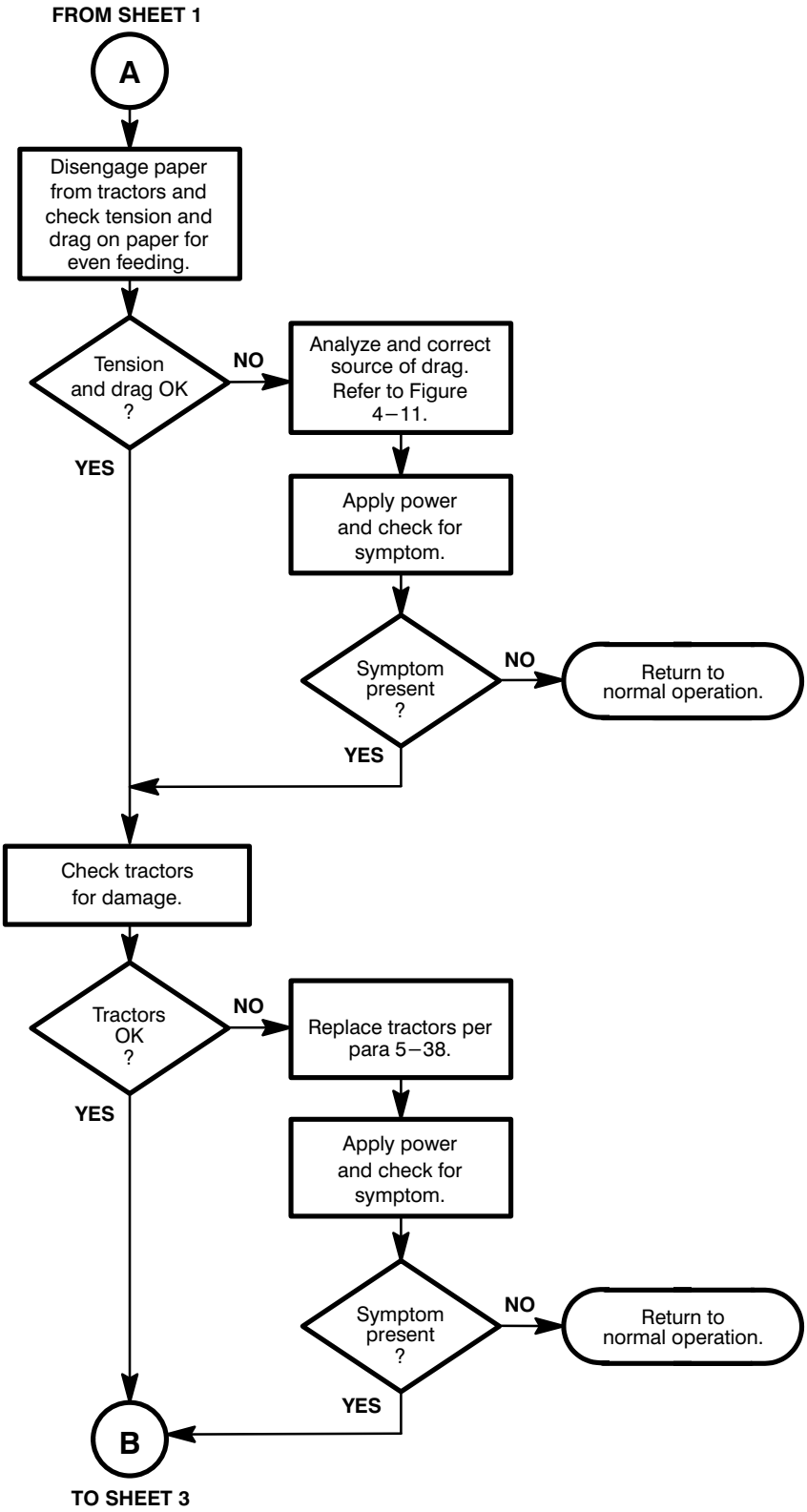


Figure 4−10. Paper Feeds Erratically (Sheet 2 of 4)

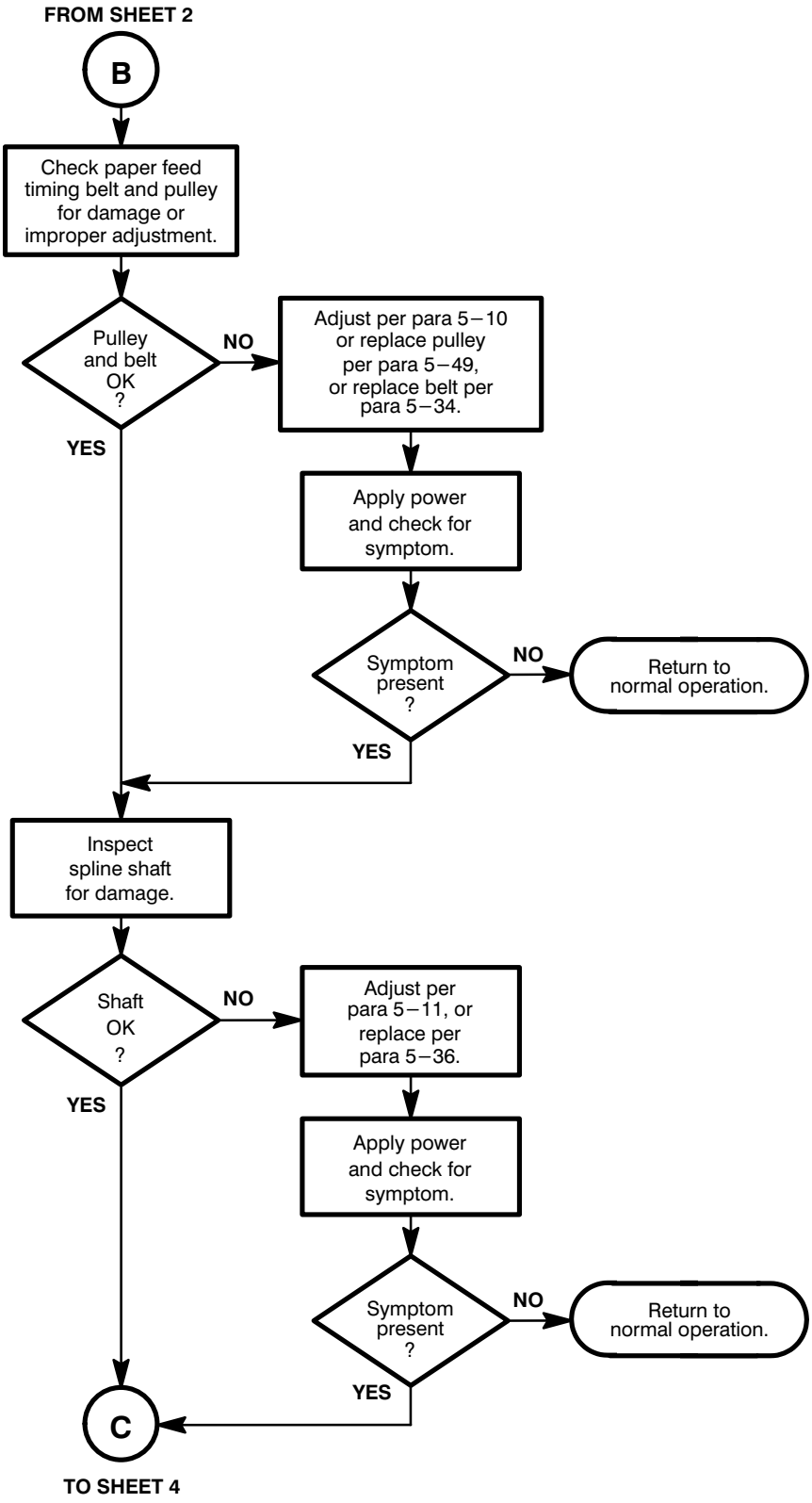


Figure 4−10. Paper Feeds Erratically (Sheet 3 of 4)

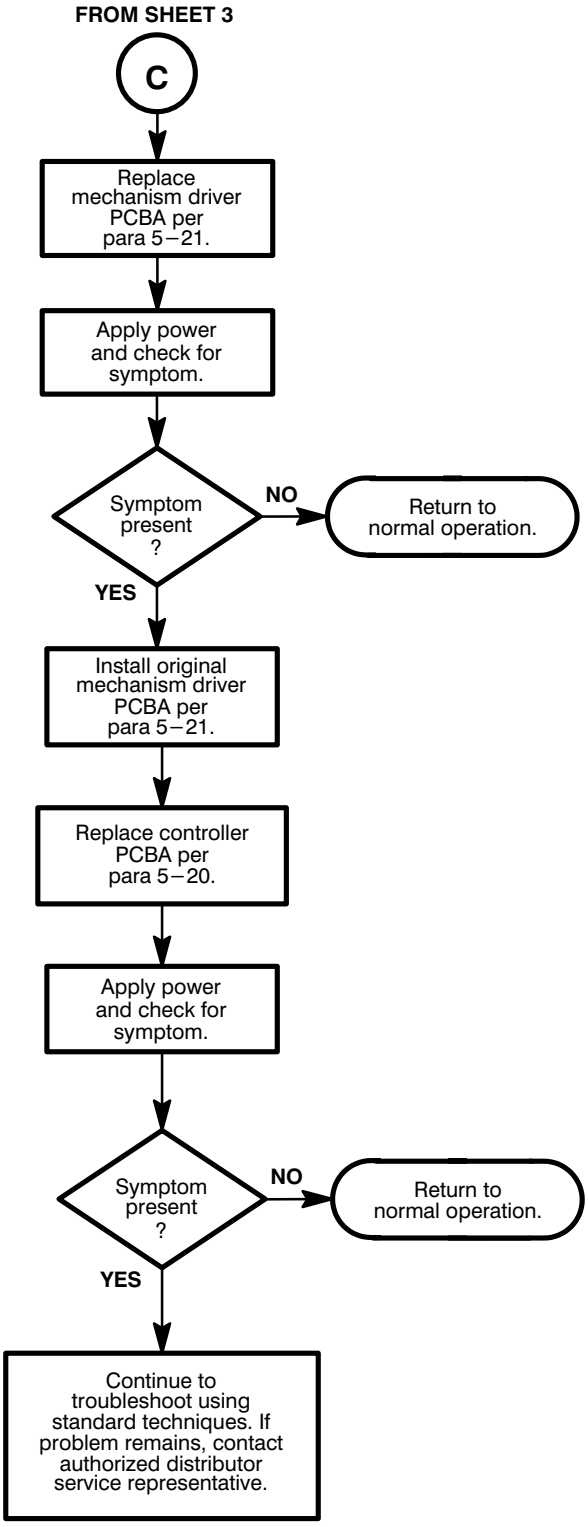

FROM SHEET 3
C
Replace mechanism driver PCBA per para 5−21.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Install original mechanism driver PCBA per para 5−21.
Replace controller PCBA per para 5−20.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Continue to troubleshoot using standard techniques. If problem remains, contact authorized distributor service representative.

Figure 4−10. Paper Feeds Erratically (Sheet 4 of 4)

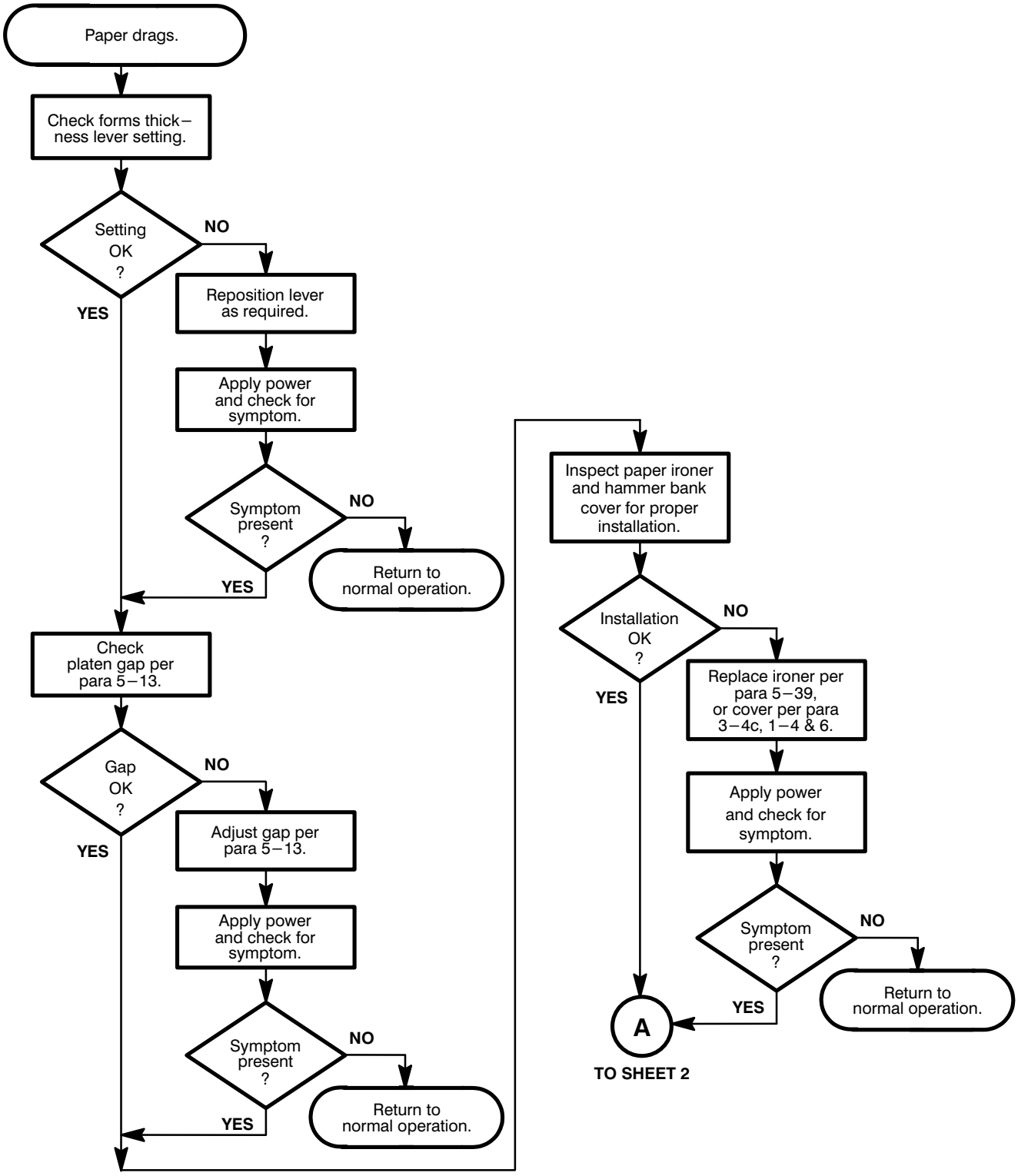


Figure 4–11. Paper Drags (Sheet 1 of 2)

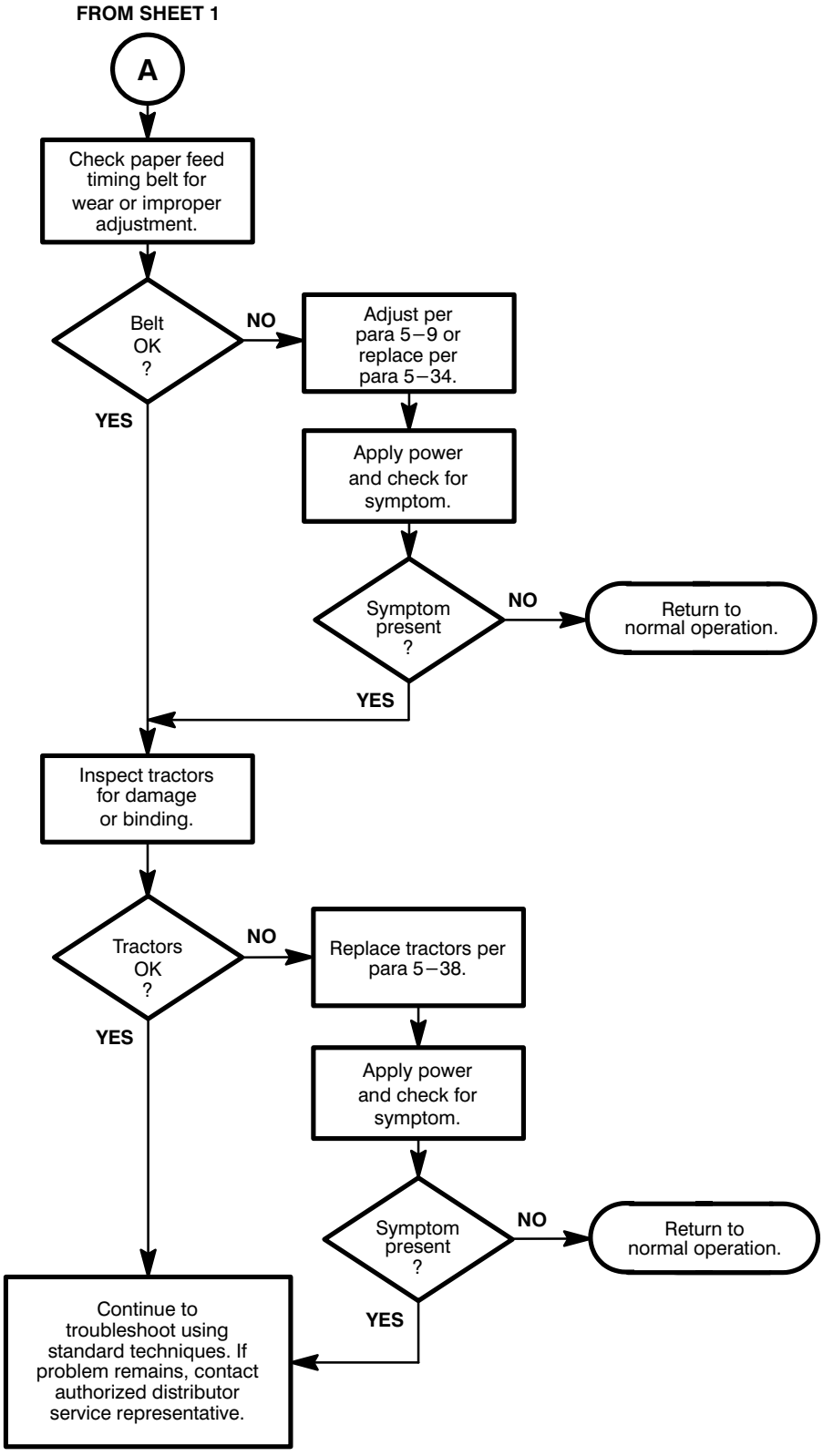


Figure 4−11. Paper Drags (Sheet 2 of 2)

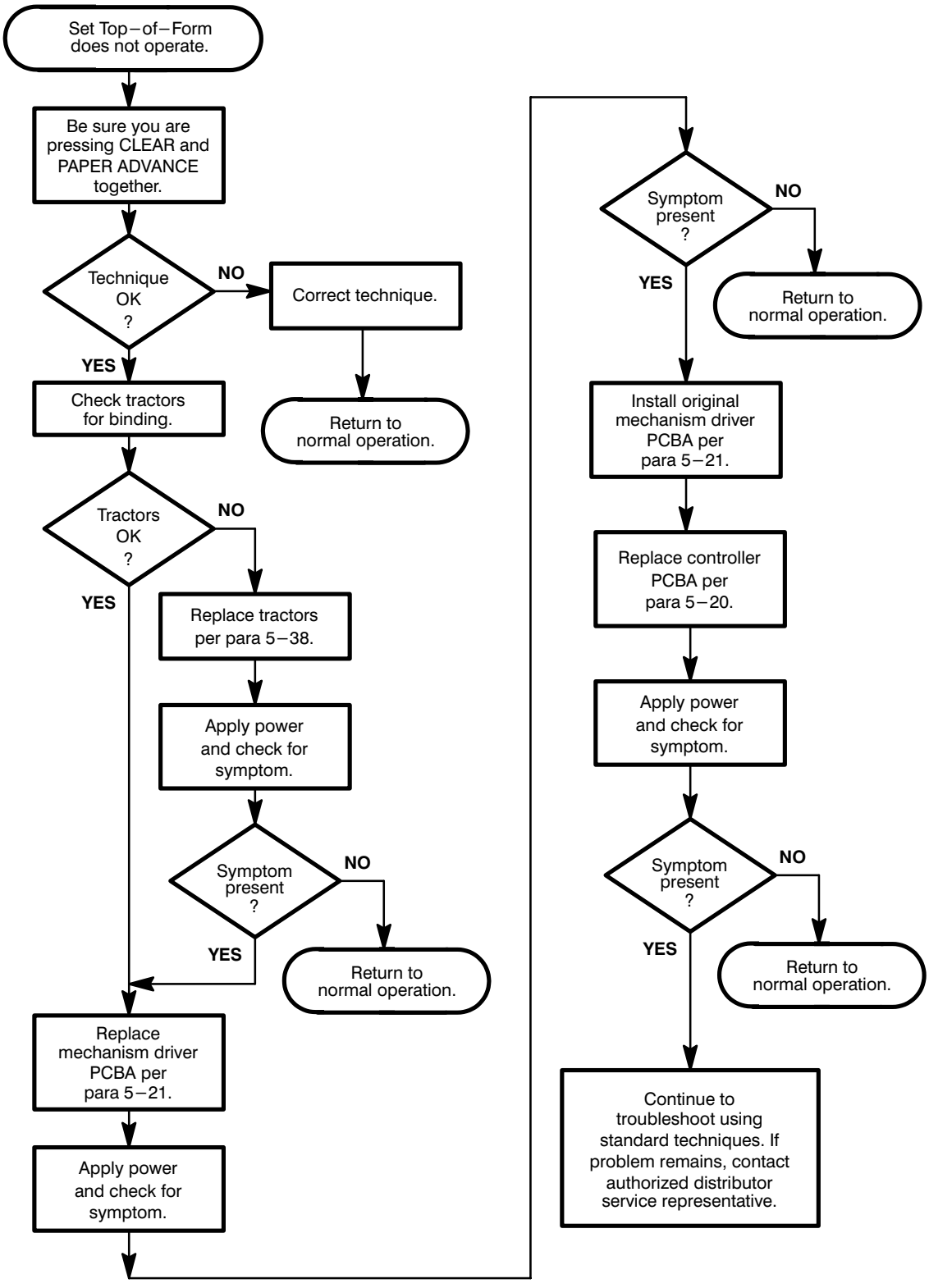


Figure 4−12. Set Top−of−Form Does not Operate

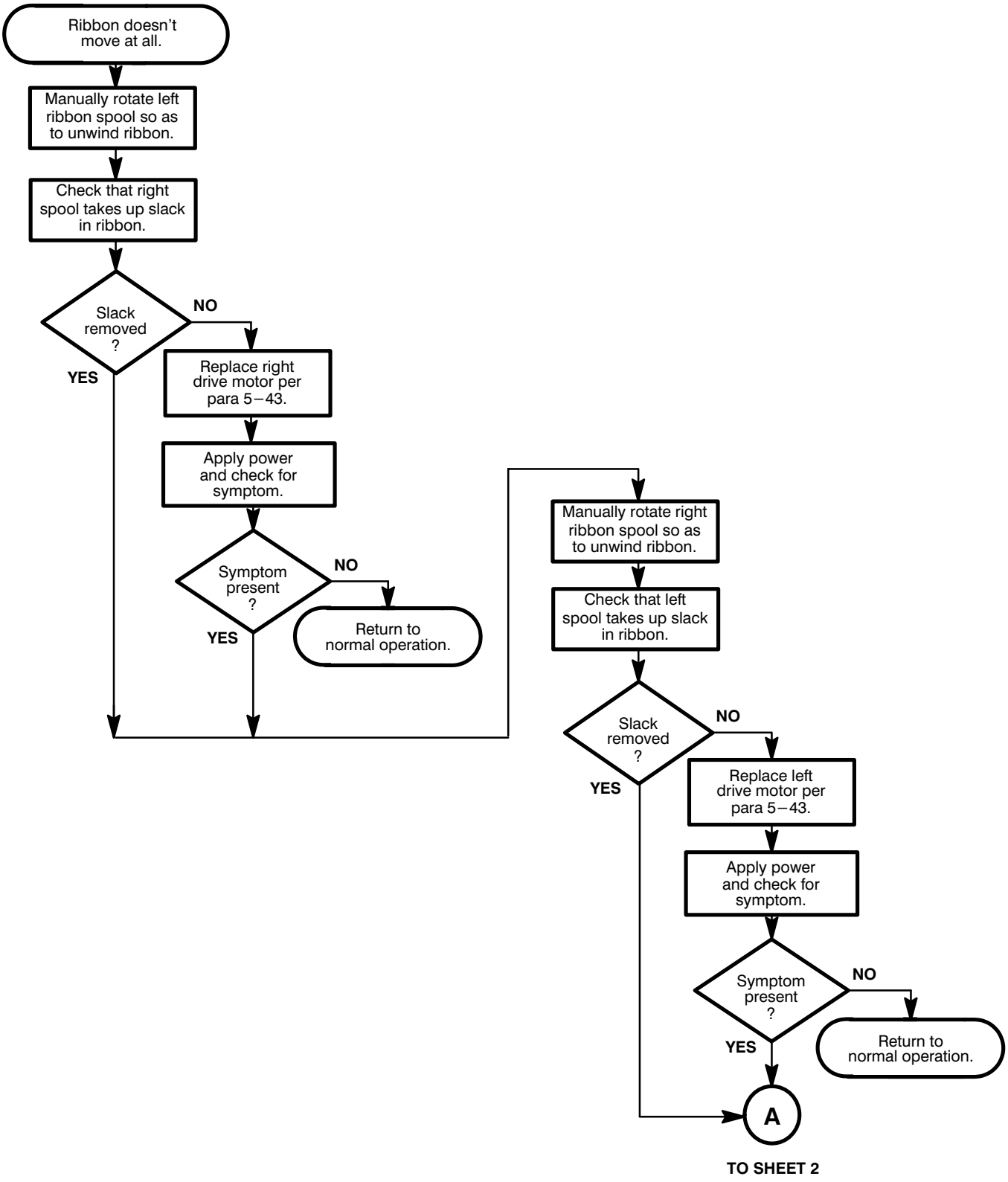

Ribbon doesn't move at all.
Manually rotate left ribbon spool so as to unwind ribbon.
Check that right spool takes up slack in ribbon.
Slack removed ?
NO
YES
Replace right drive motor per para 5−43.
Apply power and check for symptom.
Symptom present ?
NO
YES
Return to normal operation.
Manually rotate right ribbon spool so as to unwind ribbon.
Check that left spool takes up slack in ribbon.
Slack removed ?
NO
YES
Replace left drive motor per para 5−43.
Apply power and check for symptom.
Symptom present ?
NO
YES
Return to normal operation.
A
TO SHEET 2

Figure 4−13. Ribbon Does not Move at All (Sheet 1 of 2)

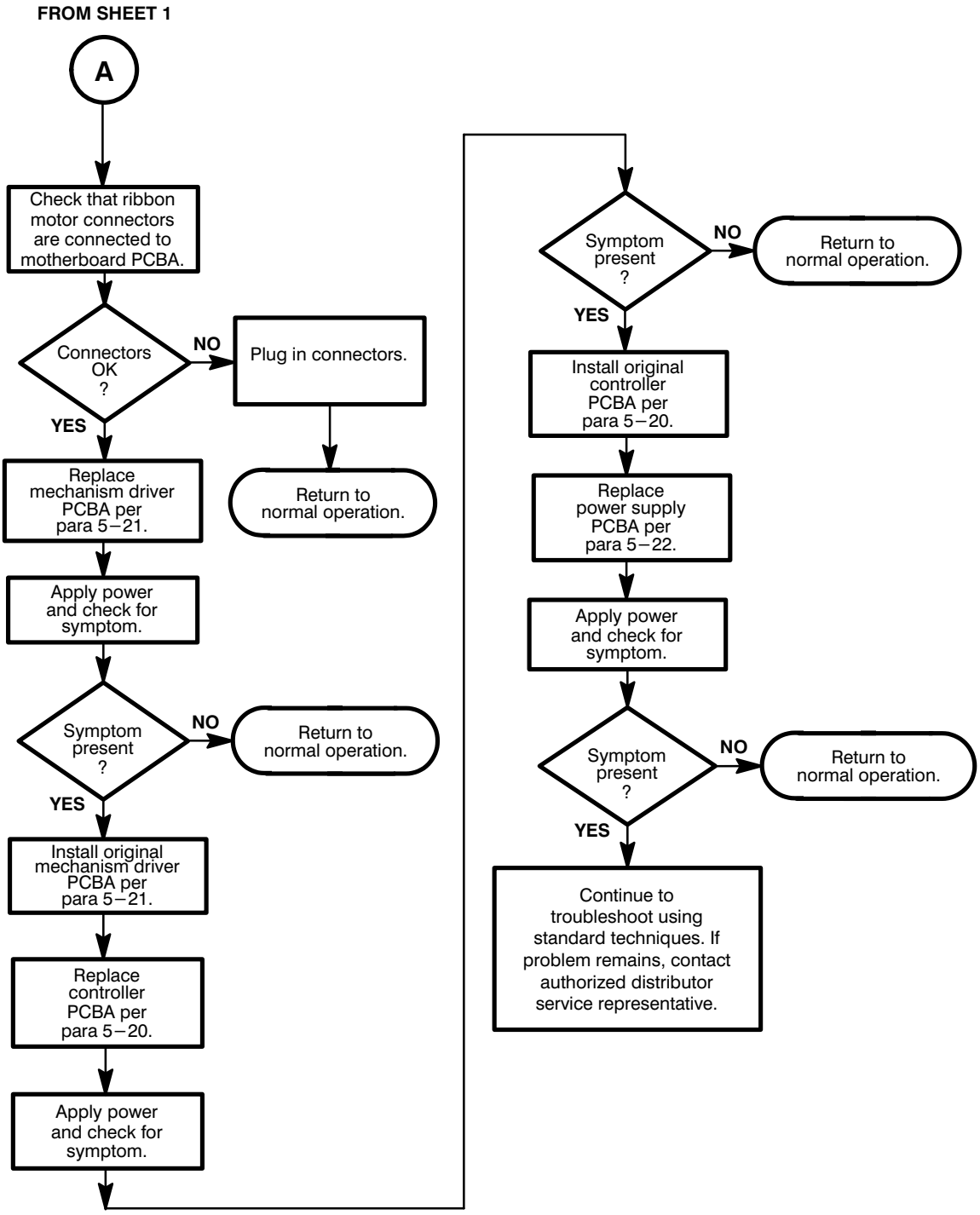

FROM SHEET 1
A
Check that ribbon motor connectors are connected to motherboard PCBA.
Connectors OK ?
NO
Plug in connectors.
Return to normal operation.
YES
Replace mechanism driver PCBA per para 5−21.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Install original mechanism driver PCBA per para 5−21.
Replace controller PCBA per para 5−20.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Install original controller PCBA per para 5−20.
Replace power supply PCBA per para 5−22.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Continue to troubleshoot using standard techniques. If problem remains, contact authorized distributor service representative.

Figure 4−13. Ribbon Does not Move at All (Sheet 2 of 2)

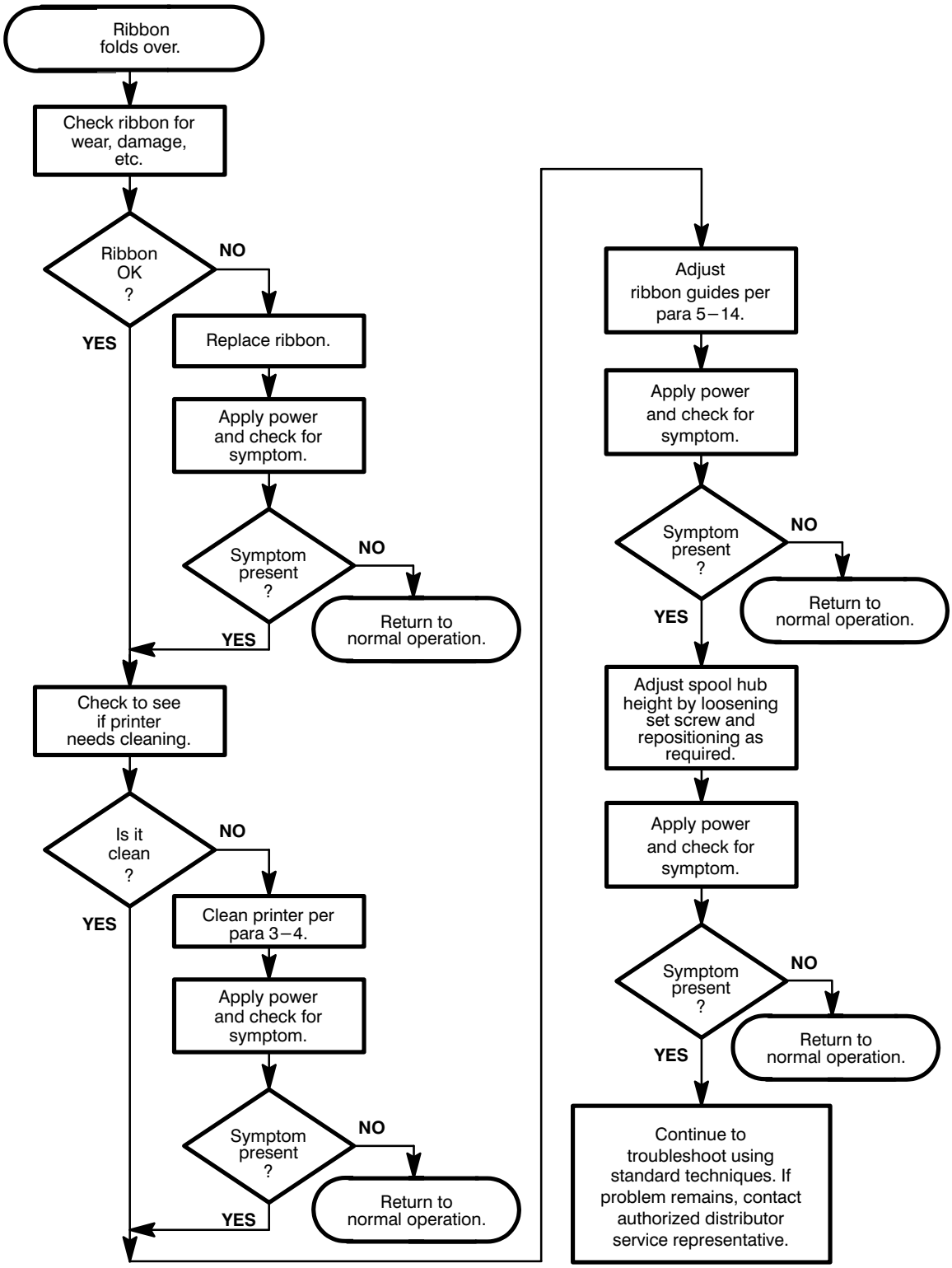


Figure 4−14. Ribbon Folds Over

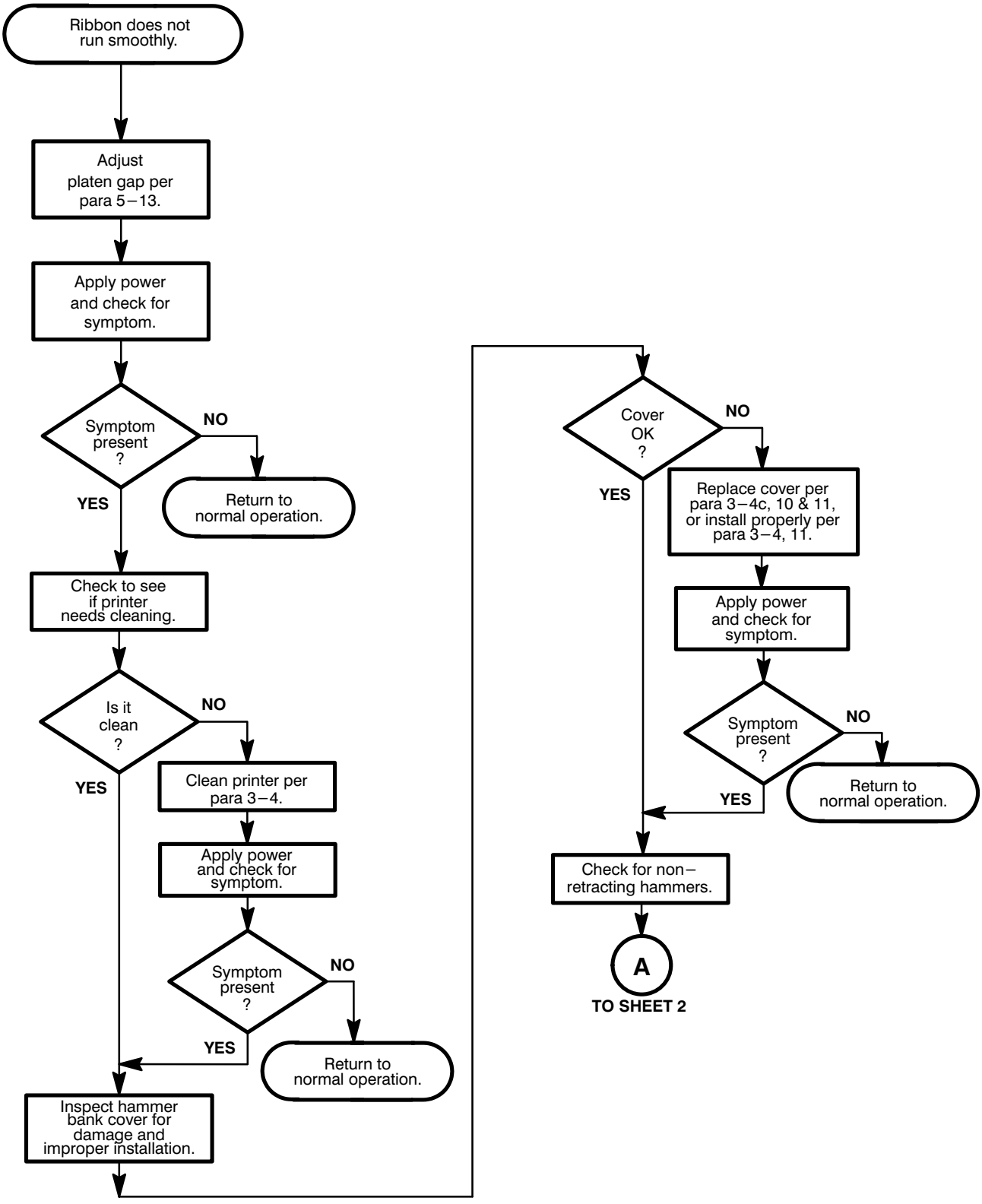


Figure 4−15. Ribbon Does Not Run Smoothly (Sheet 1 of 2)

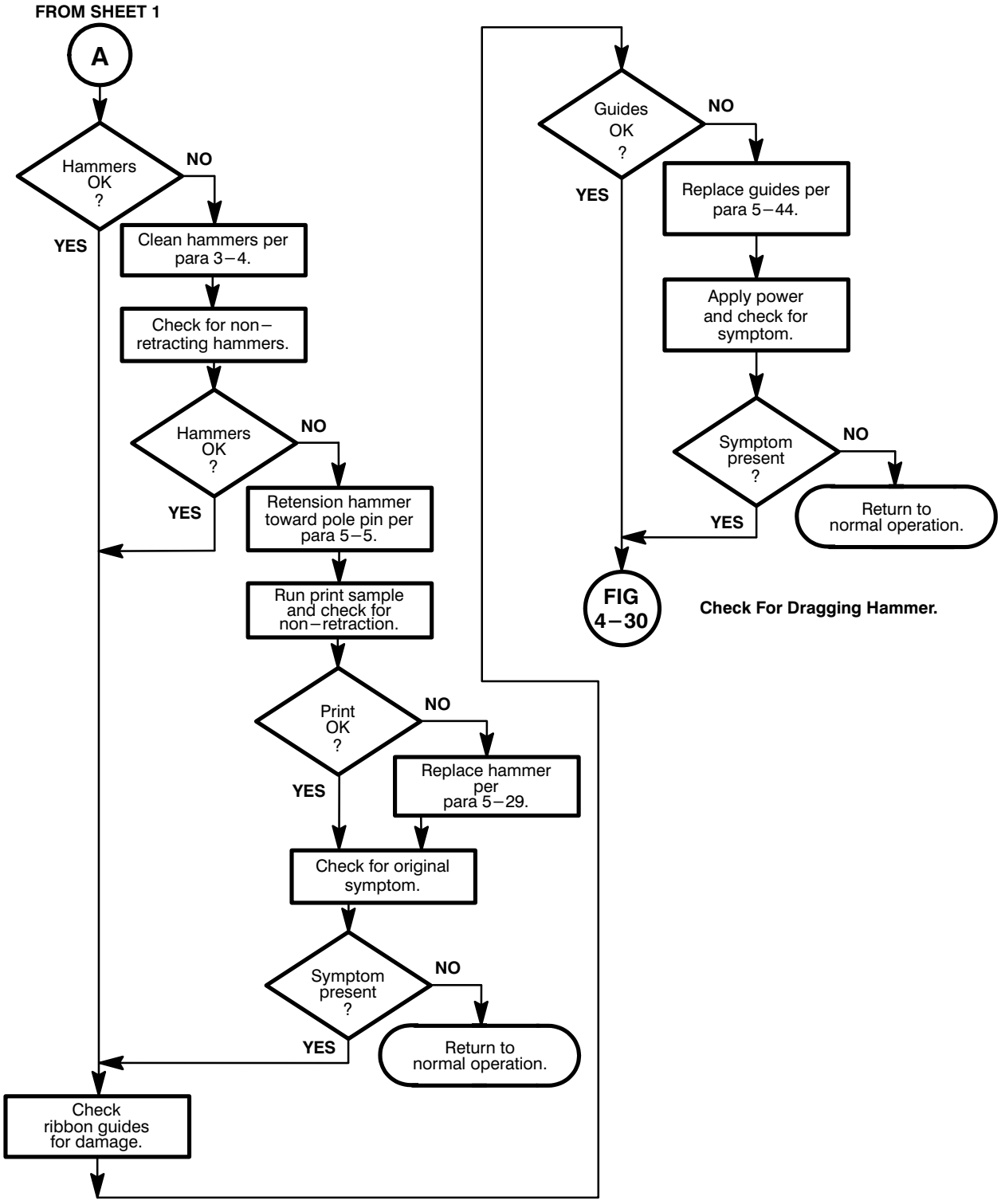


Figure 4−15. Ribbon Does Not Run Smoothly (Sheet 2 of 2)

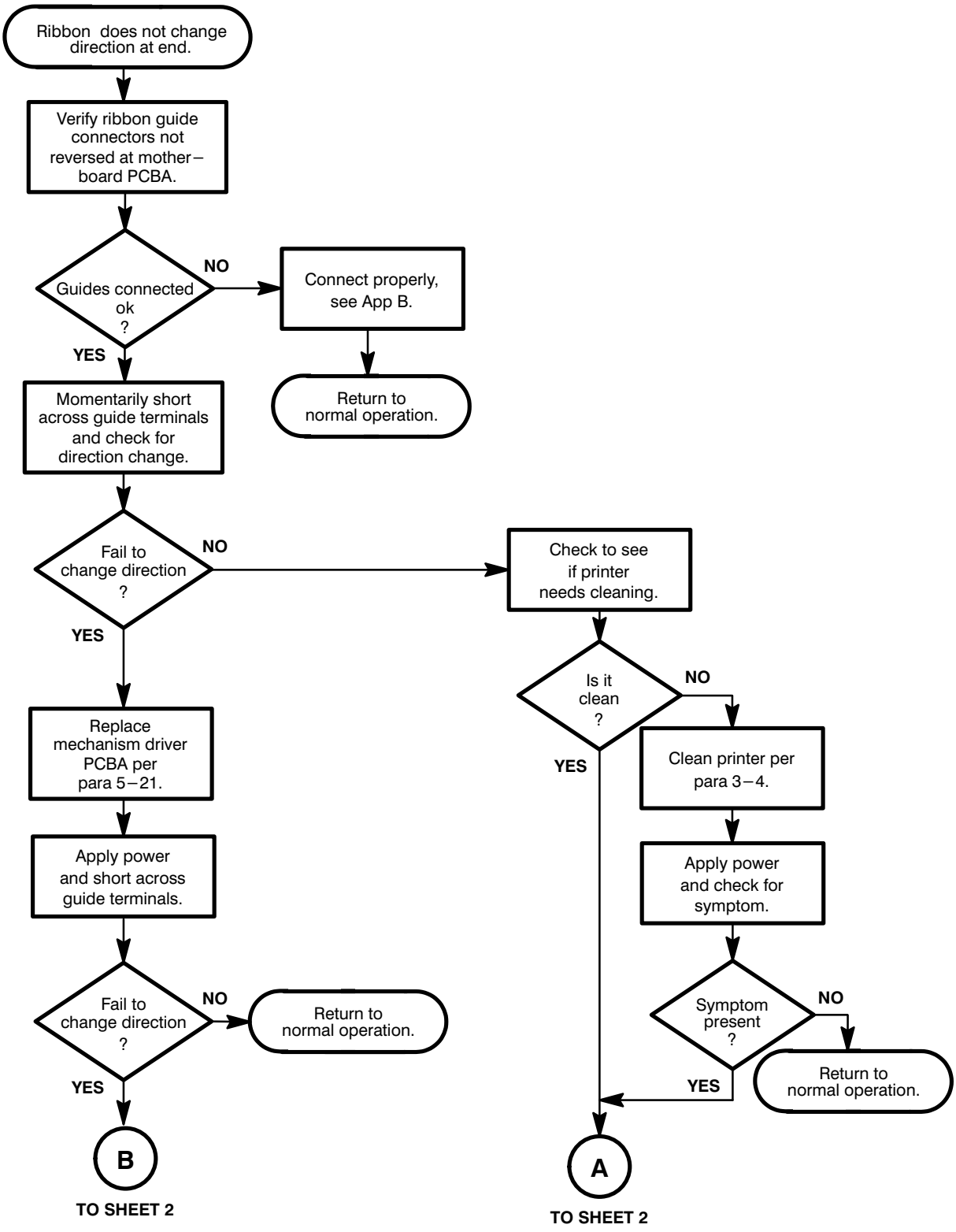


Figure 4–16. Ribbon Does Not Change Direction at End (Sheet 1 of 2)

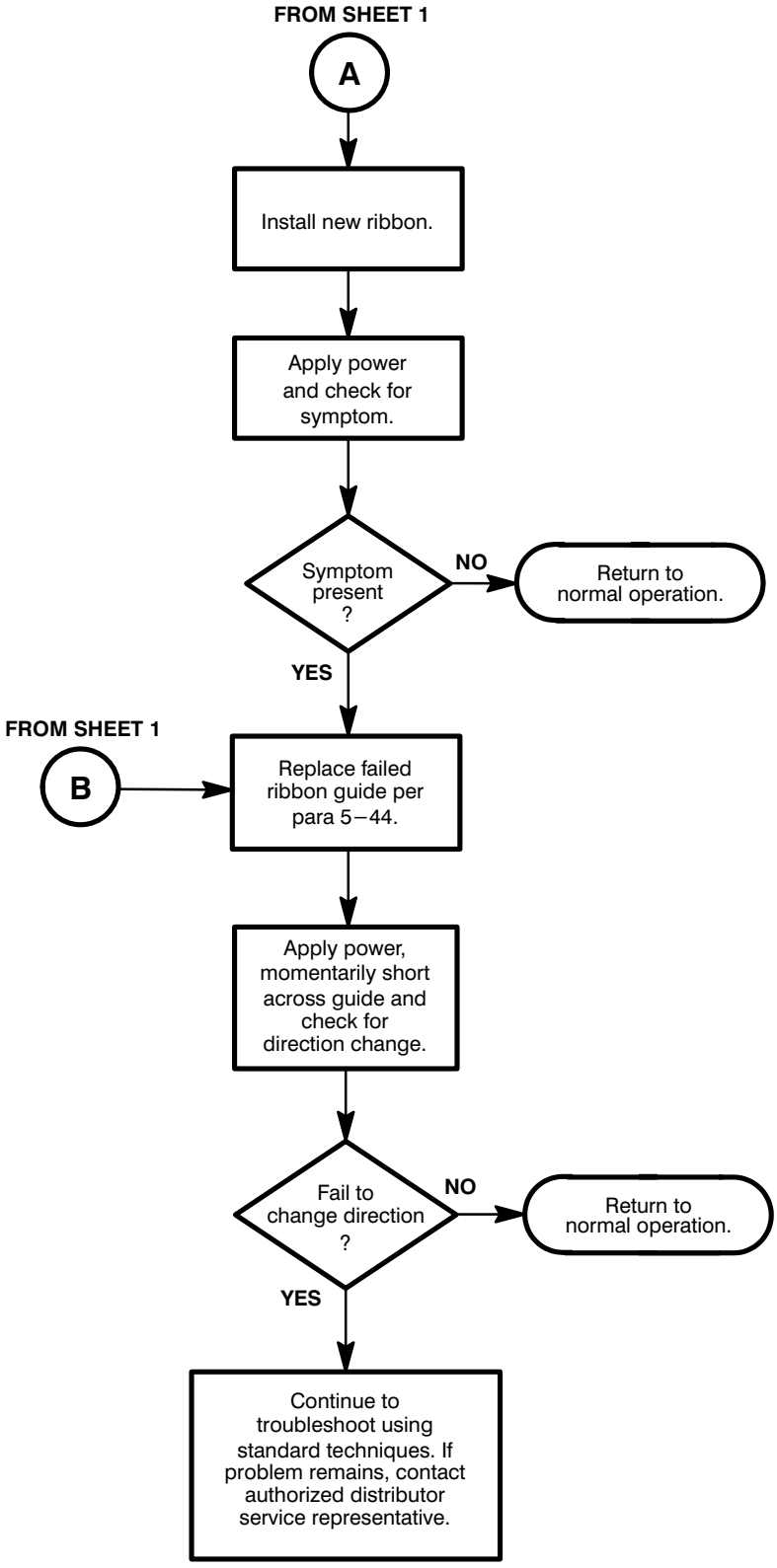

FROM SHEET 1
A
Install new ribbon.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
FROM SHEET 1
B
Replace failed ribbon guide per para 5−44.
Apply power, momentarily short across guide and check for direction change.
Fail to change direction ?
NO
Return to normal operation.
YES
Continue to troubleshoot using standard techniques. If problem remains, contact authorized distributor service representative.

Figure 4−16. Ribbon Does Not Change Direction at End (Sheet 2 of 2)

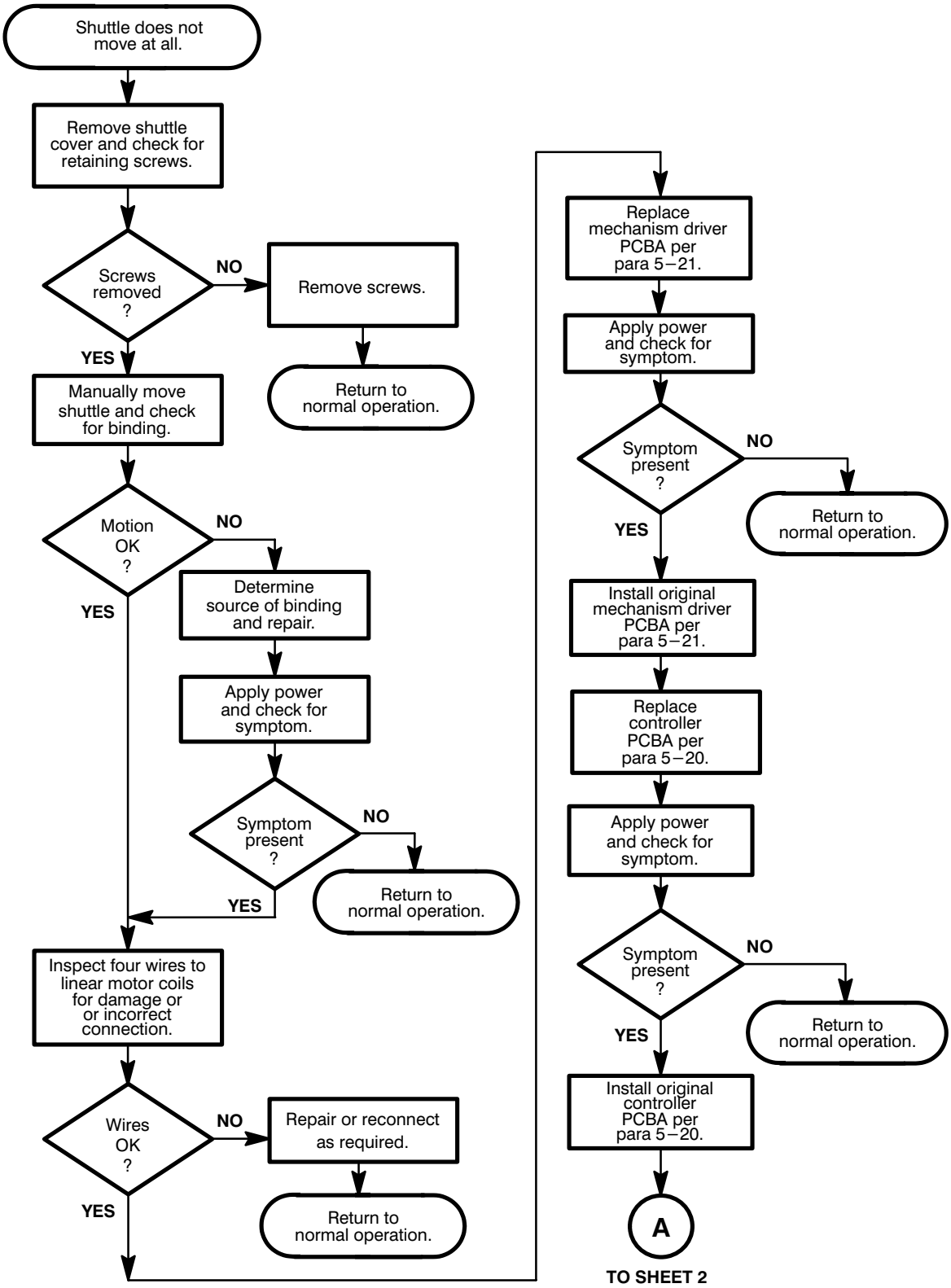


Figure 4−17. Shuttle Does Not Move at All (Sheet 1 of 2)

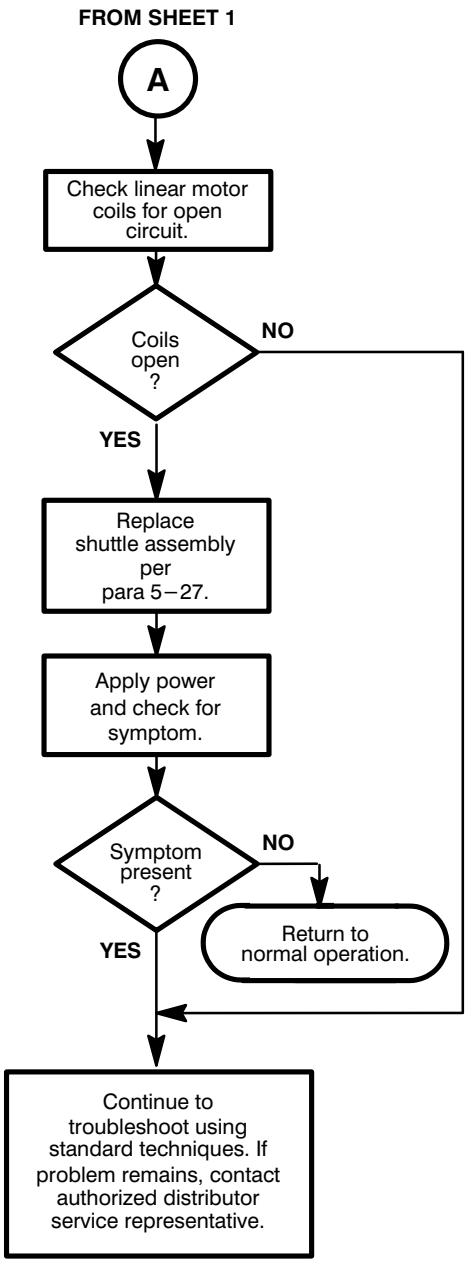


Figure 4−17. Shuttle Does Not Move at All (Sheet 2 of 2)

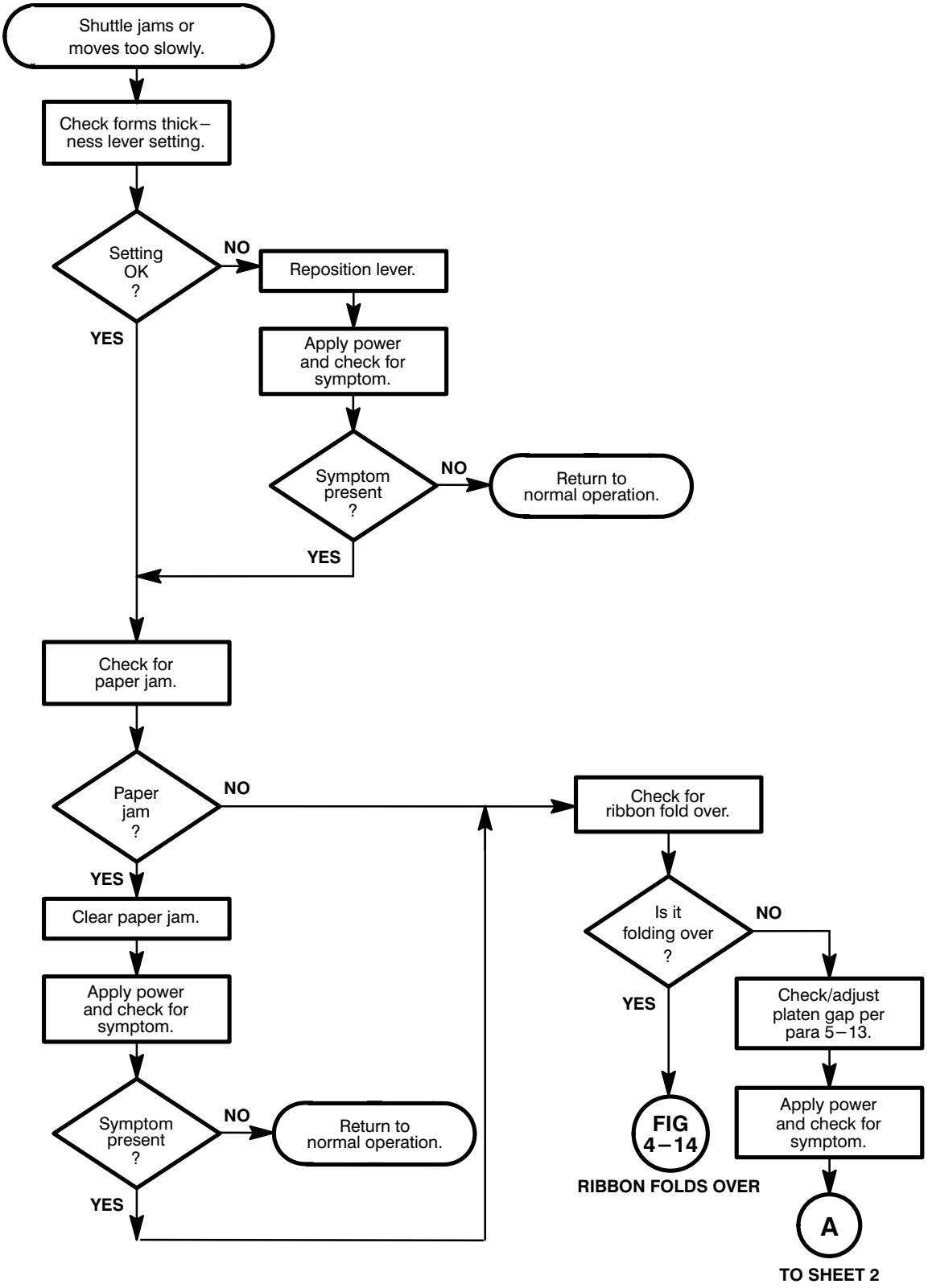


Figure 4−18. Shuttle Jams or Moves too Slowly (Sheet 1 of 3)

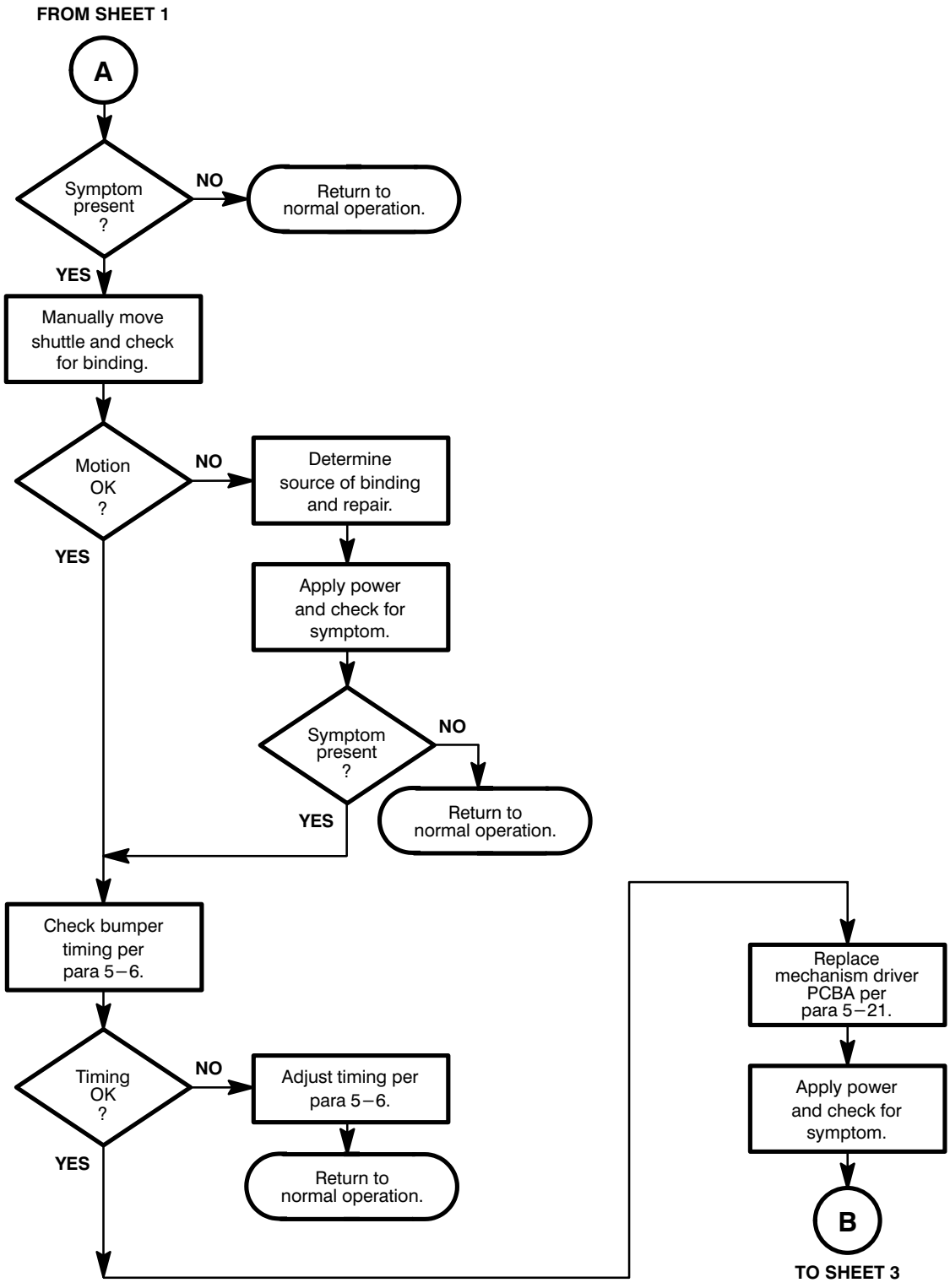


Figure 4−18. Shuttle Jams or Moves too Slowly (Sheet 2 of 3)

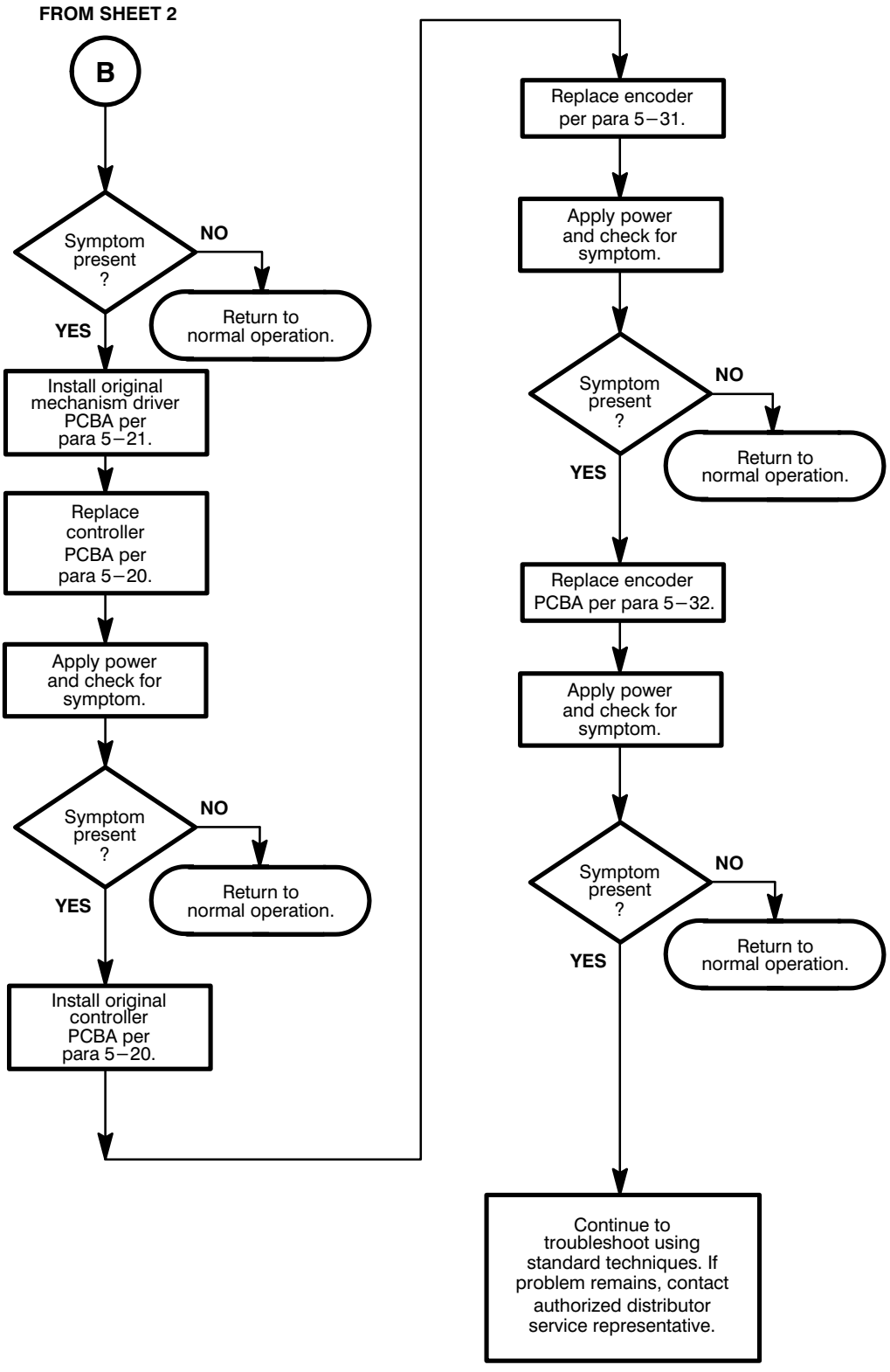


Figure 4−18. Shuttle Jams or Moves too Slowly (Sheet 3 of 3)

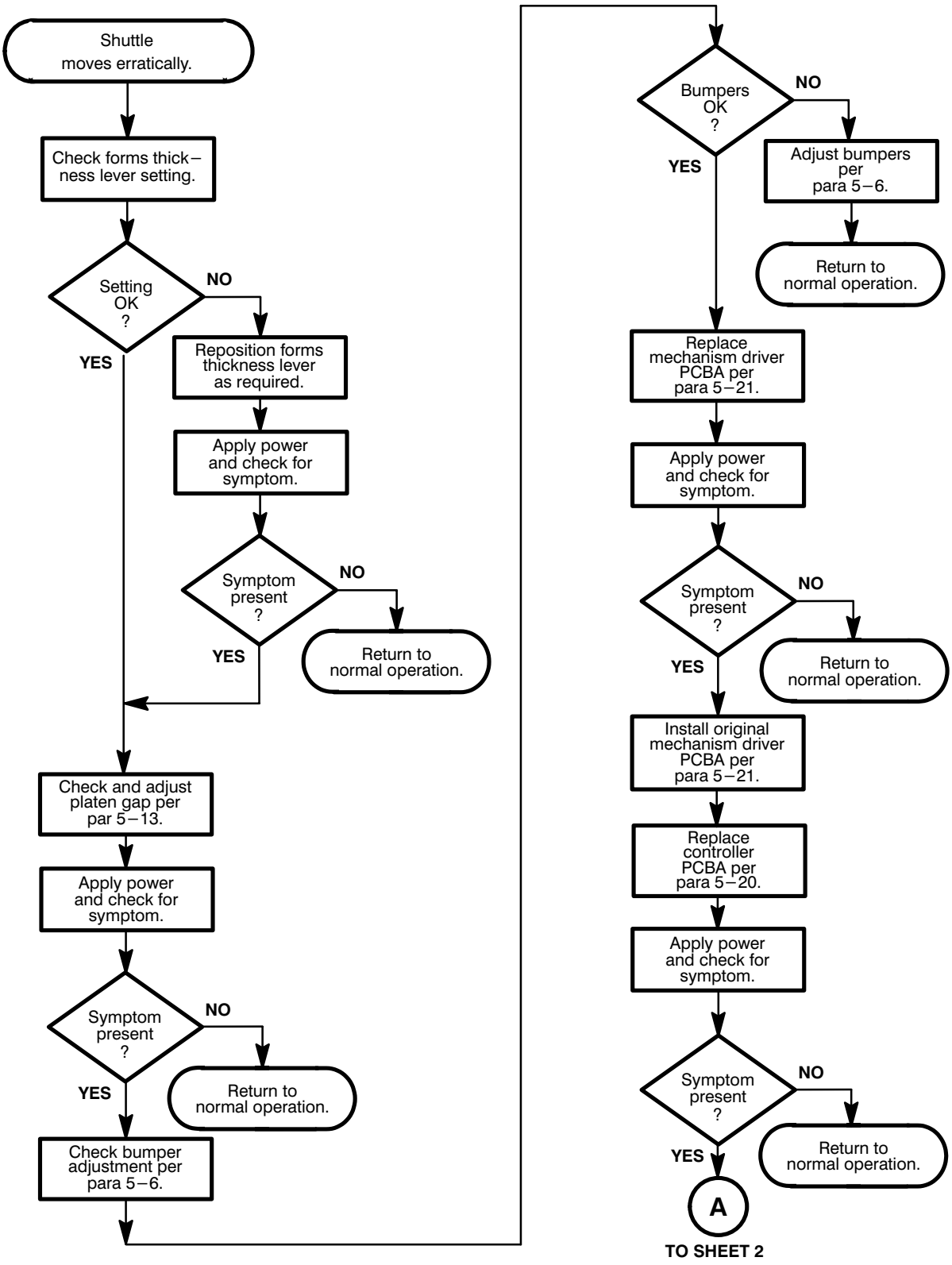


Figure 4−19. Shuttle Moves Erratically (Sheet 1 of 2)

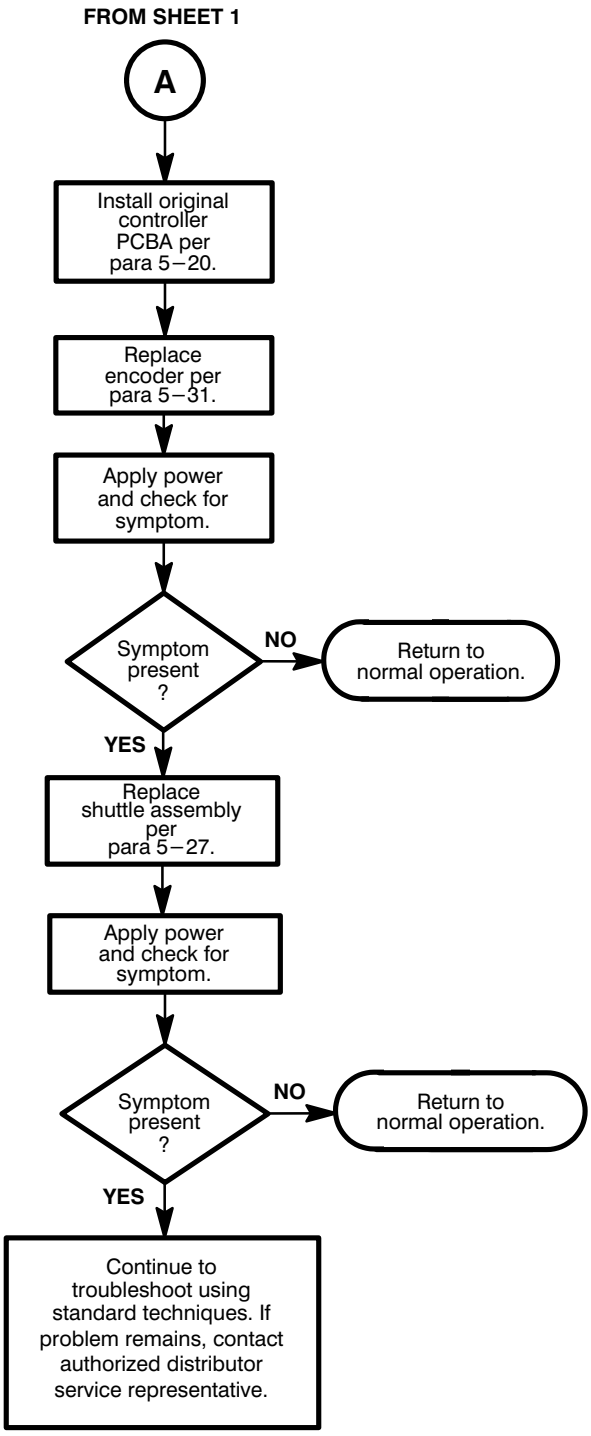

FROM SHEET 1
A
Install original controller PCBA per para 5−20.
Replace encoder per para 5−31.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Replace shuttle assembly per para 5−27.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Continue to troubleshoot using standard techniques. If problem remains, contact authorized distributor service representative.

Figure 4−19. Shuttle Moves Erratically (Sheet 2 of 2)

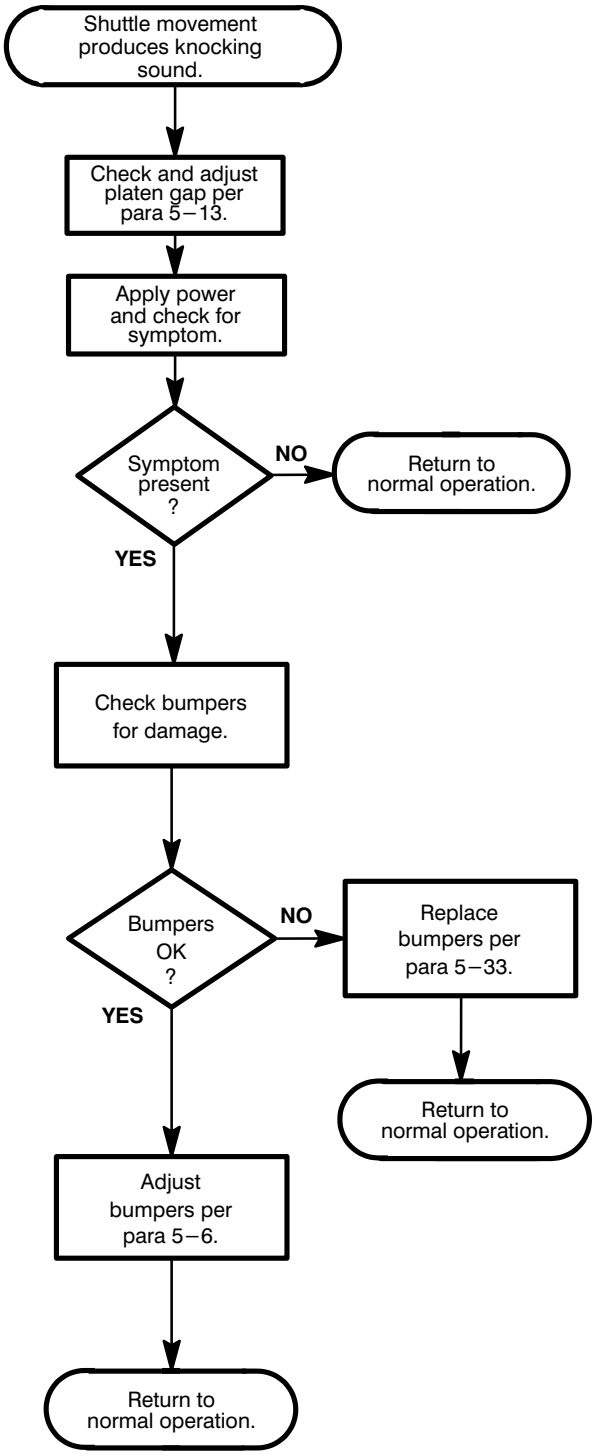


Figure 4−20. Shuttle Movement Produces Knocking Sound

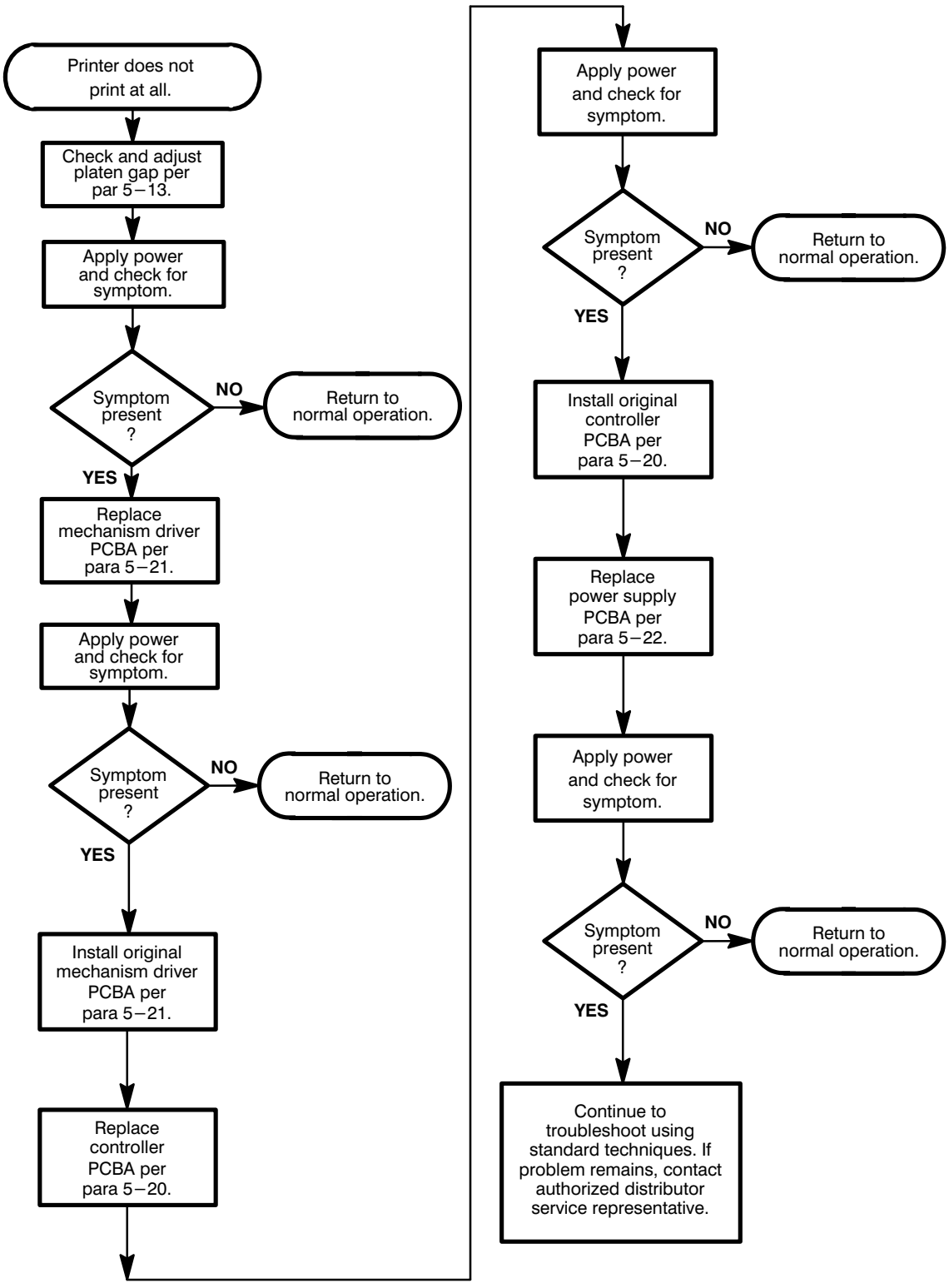

Printer does not print at all.
Check and adjust platen gap per par 5−13.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Replace mechanism driver PCBA per para 5−21.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Install original mechanism driver PCBA per para 5−21.
Replace controller PCBA per para 5−20.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Install original controller PCBA per para 5−20.
Replace power supply PCBA per para 5−22.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Continue to troubleshoot using standard techniques. If problem remains, contact authorized distributor service representative.

Figure 4−21. Printer Does Not Print at All

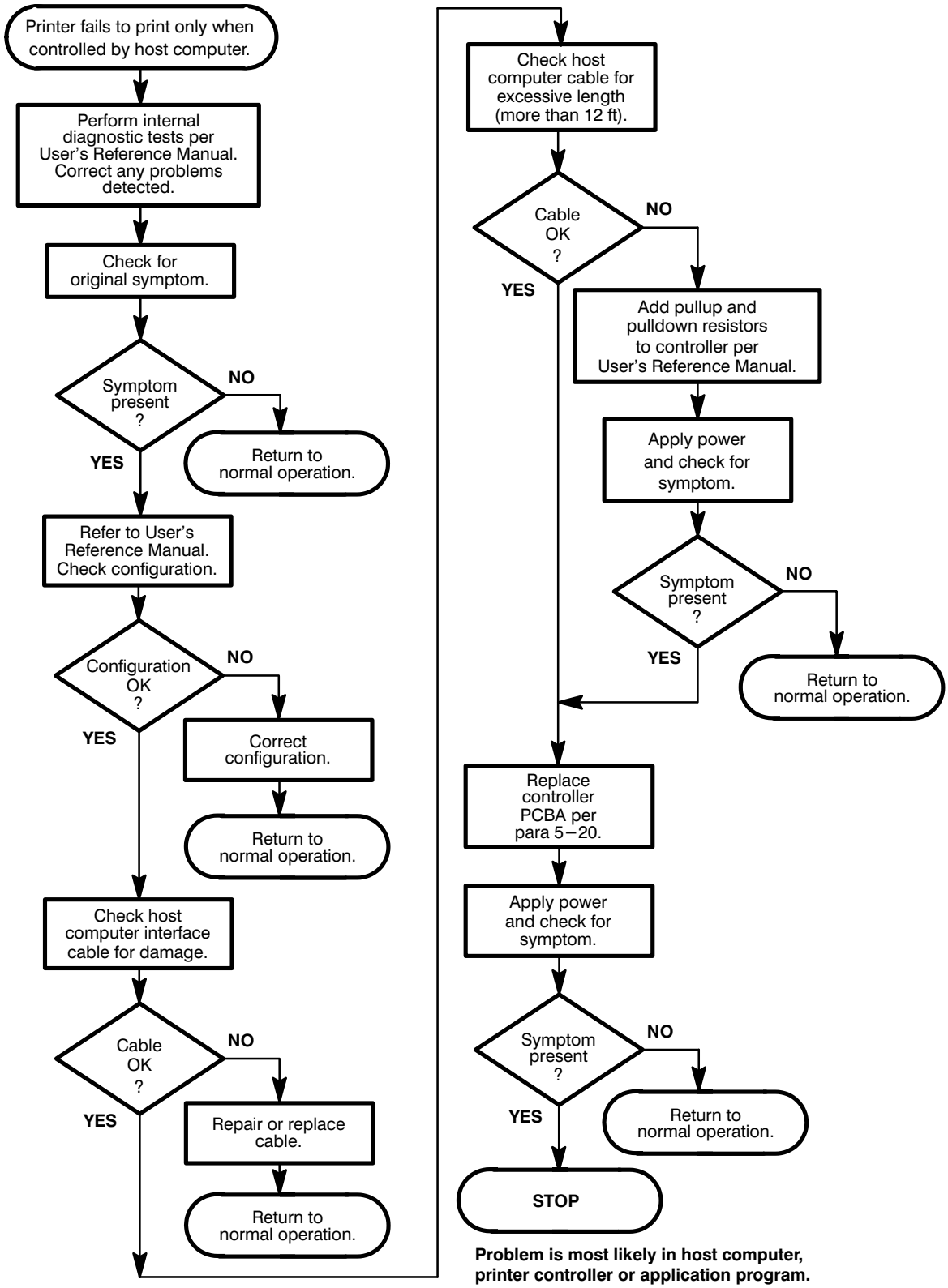

Printer fails to print only when controlled by host computer.
Perform internal diagnostic tests per User's Reference Manual. Correct any problems detected.
Check for original symptom.
Symptom present ?
NO
YES
Return to normal operation.
Refer to User's Reference Manual. Check configuration.
Configuration OK ?
NO
YES
Correct configuration.
Return to normal operation.
Check host computer interface cable for damage.
Cable OK ?
NO
YES
Repair or replace cable.
Return to normal operation.
Check host computer cable for excessive length (more than 12 ft).
Cable OK ?
NO
YES
Add pullup and pulldown resistors to controller per User's Reference Manual.
Apply power and check for symptom.
Symptom present ?
NO
YES
Return to normal operation.
Replace controller PCBA per para 5−20.
Apply power and check for symptom.
Symptom present ?
NO
YES
Return to normal operation.
STOP
Problem is most likely in host computer, printer controller or application program.

Figure 4−22. Printer Fails to Print Only When Controlled by Host Computer

Figure 4−23. Missing Characters Example

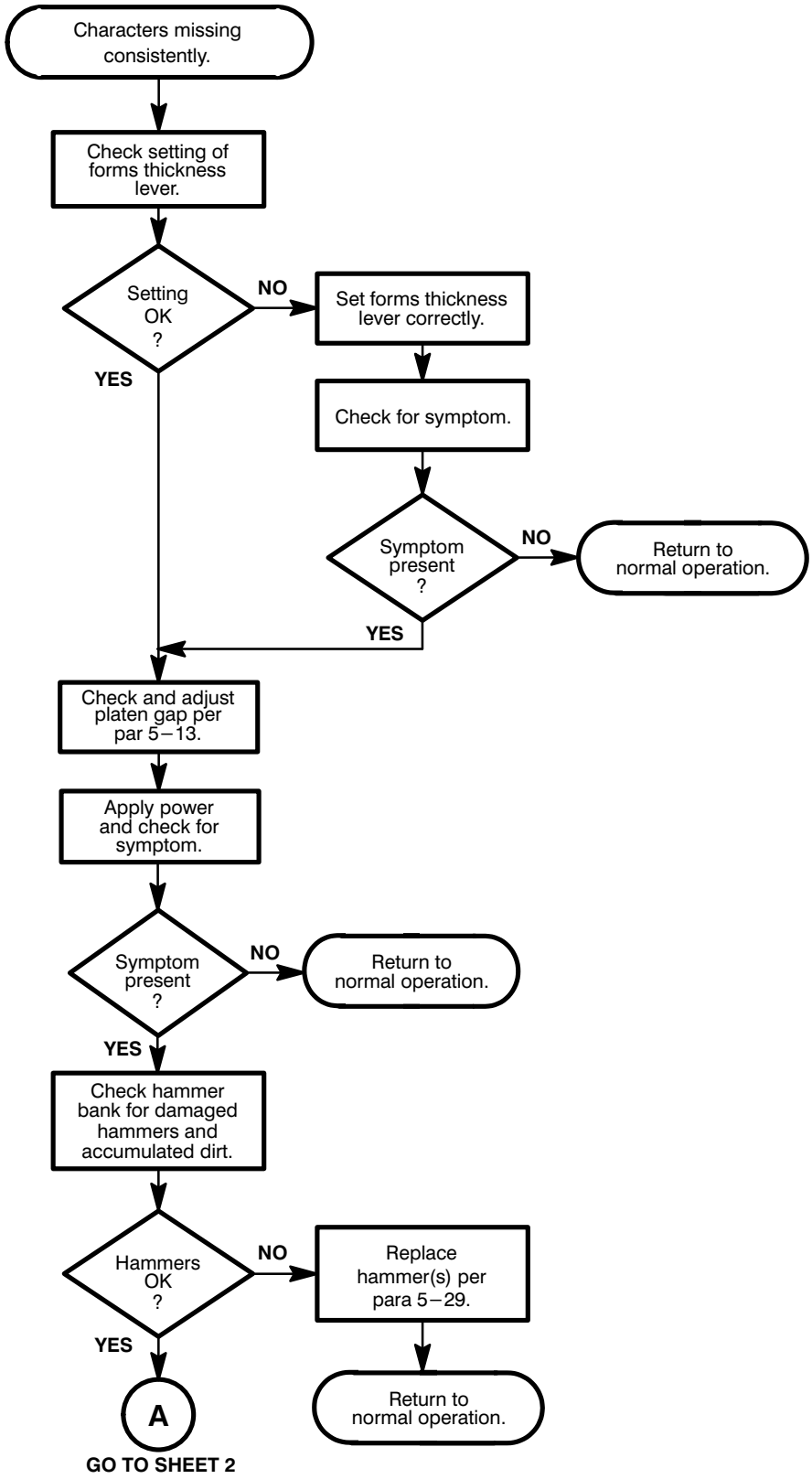


Figure 4−24. Characters Missing Consistently (Sheet 1 of 3)

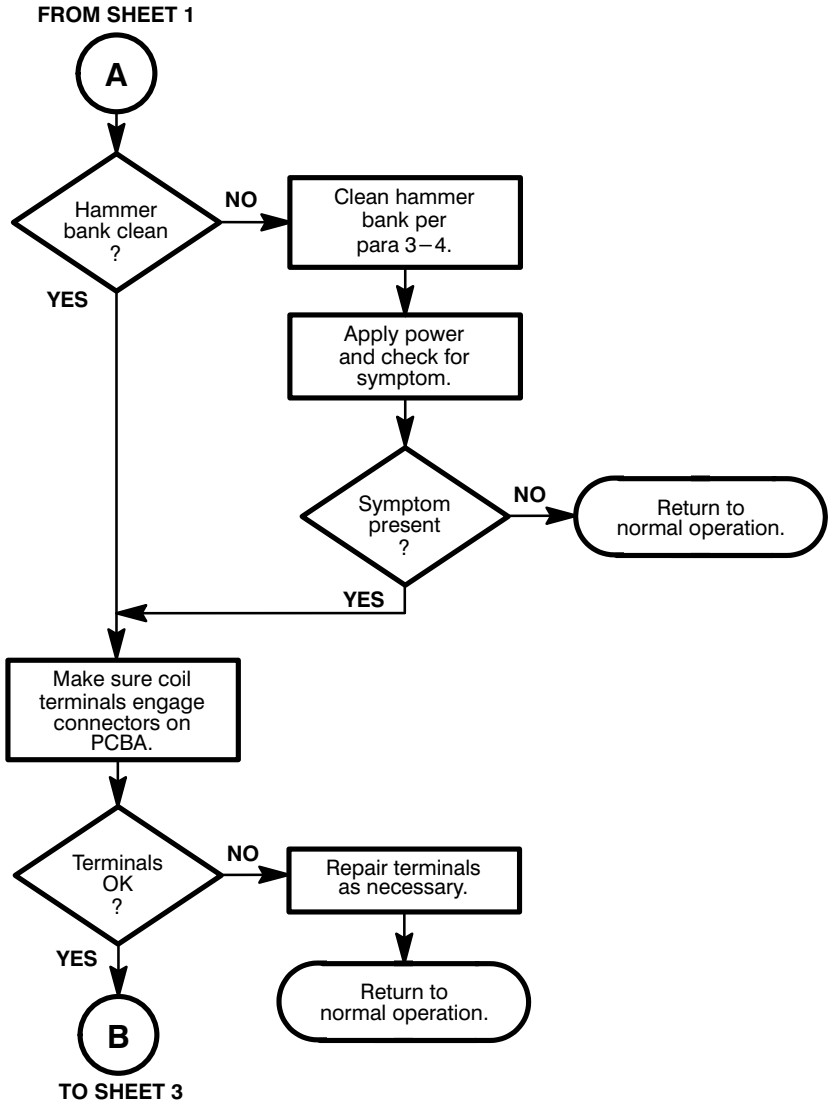


Figure 4−24. Characters Missing Consistently (Sheet 2 of 3)

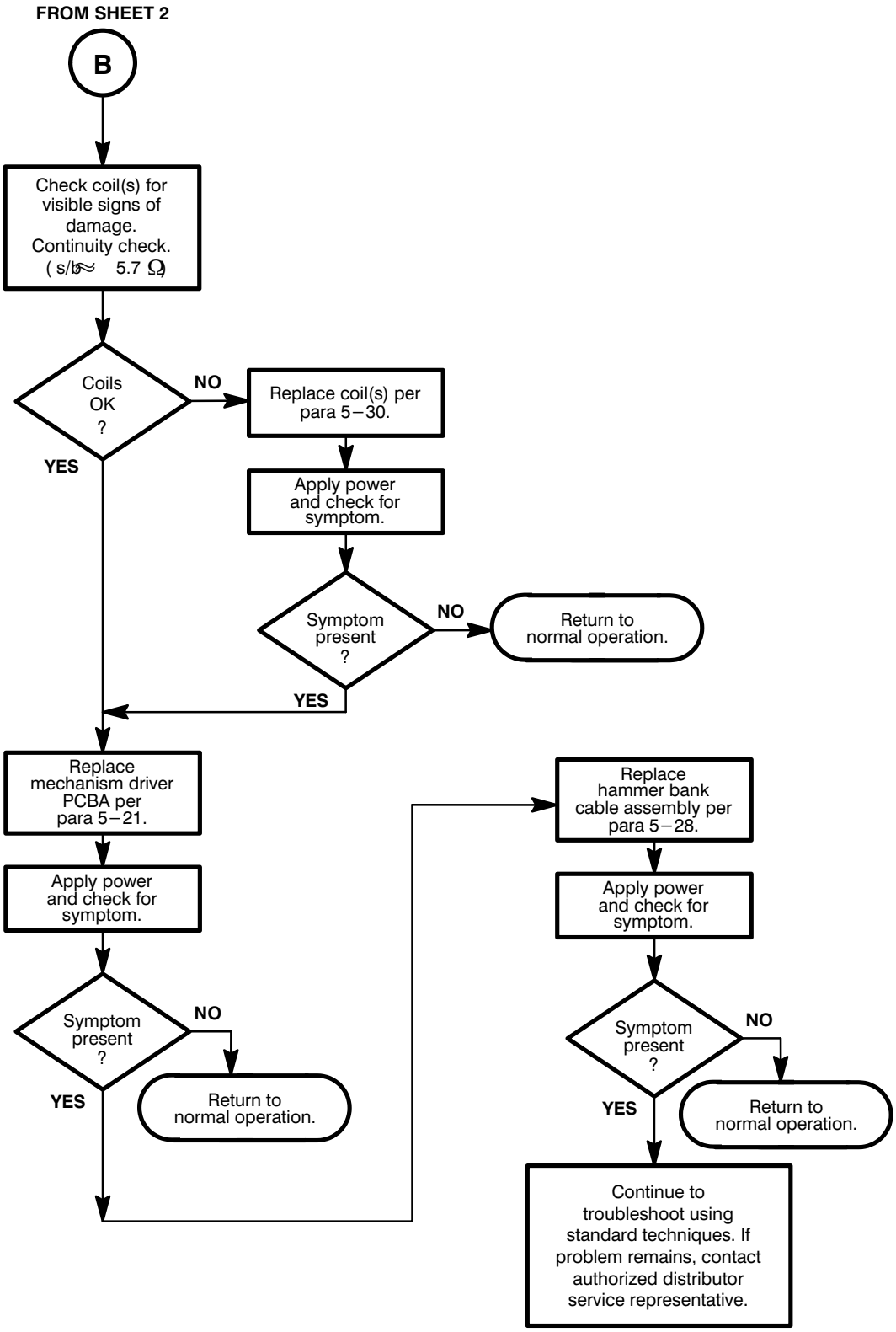

FROM SHEET 2
B
Check coil(s) for visible signs of damage. Continuity check. (s/b≈ 5.7 Ω)
Coils OK ?
NO
YES
Replace coil(s) per para 5−30.
Apply power and check for symptom.
Symptom present ?
NO
YES
Return to normal operation.
Replace mechanism driver PCBA per para 5−21.
Apply power and check for symptom.
Symptom present ?
NO
YES
Return to normal operation.
Replace hammer bank cable assembly per para 5−28.
Apply power and check for symptom.
Symptom present ?
NO
YES
Return to normal operation.
Continue to troubleshoot using standard techniques. If problem remains, contact authorized distributor service representative.

Figure 4−24. Characters Missing Consistently (Sheet 3 of 3)

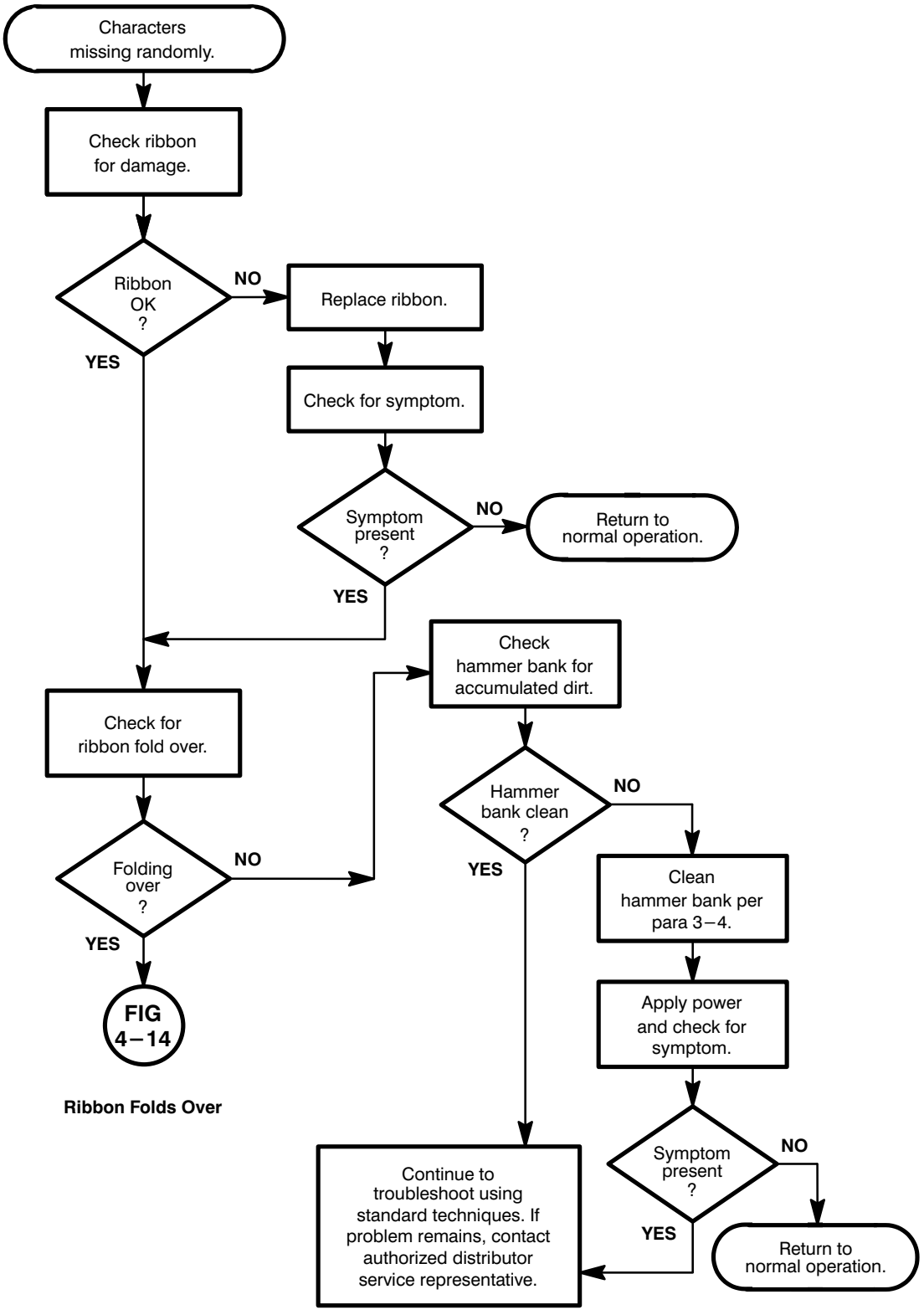


Figure 4−25. Characters Missing Randomly

Figure 4−26. Missing Dots Example (Sheet 1 of 2)

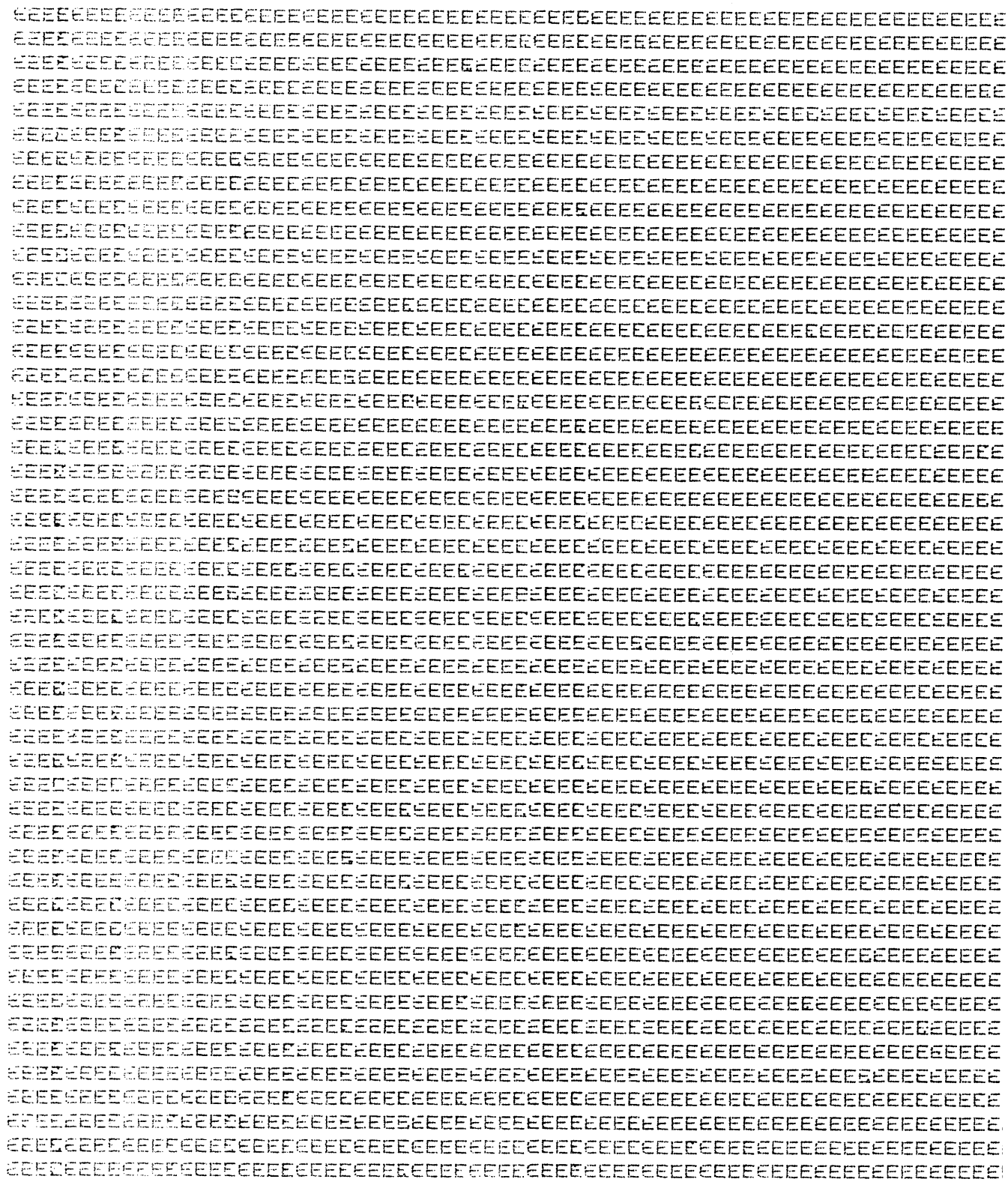


Figure 4−26. Missing Dots Example (Sheet 2 of 2)

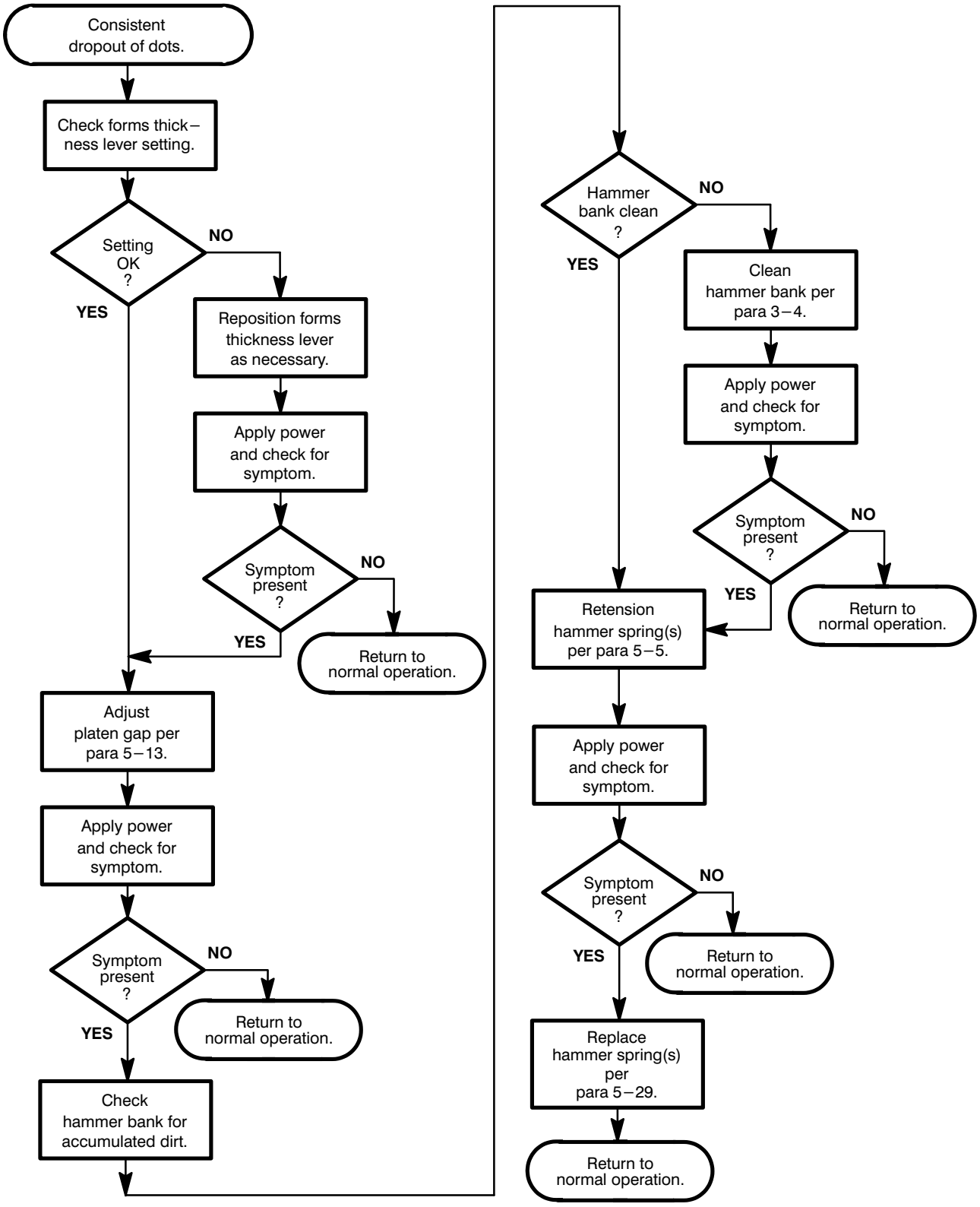


Figure 4–27. Consistent Dropout of Dots

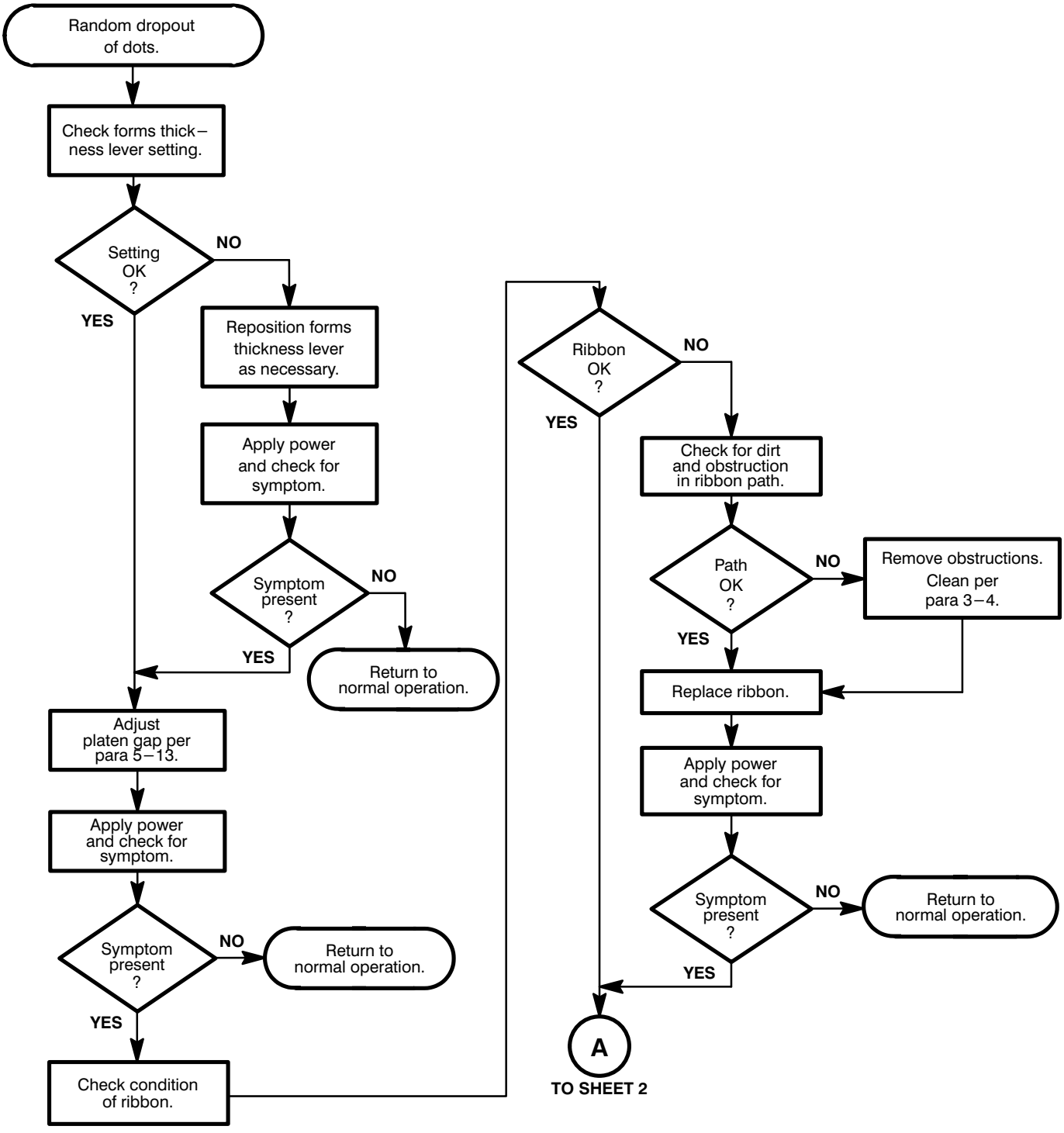


Figure 4−28. Random Dropout of Dots (Sheet 1 of 3)

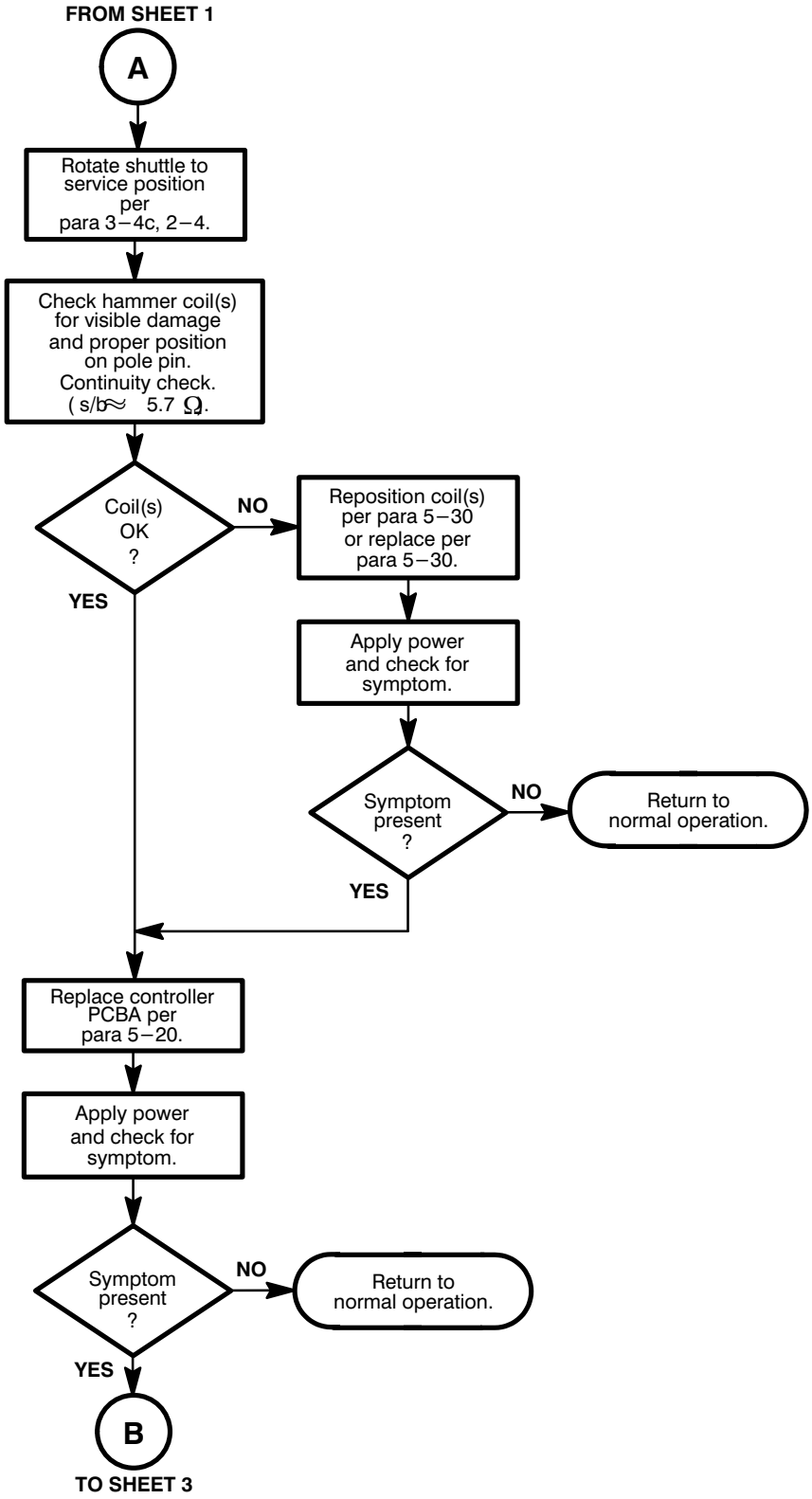

FROM SHEET 1
A
Rotate shuttle to service position per para 3−4c, 2−4.
Check hammer coil(s) for visible damage and proper position on pole pin. Continuity check. (s/b≈ 5.7 Ω.
Coil(s) OK ?
NO
YES
Reposition coil(s) per para 5−30 or replace per para 5−30.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Replace controller PCBA per para 5−20.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
B
TO SHEET 3

Figure 4−28. Random Dropout of Dots (Sheet 2 of 3)

r

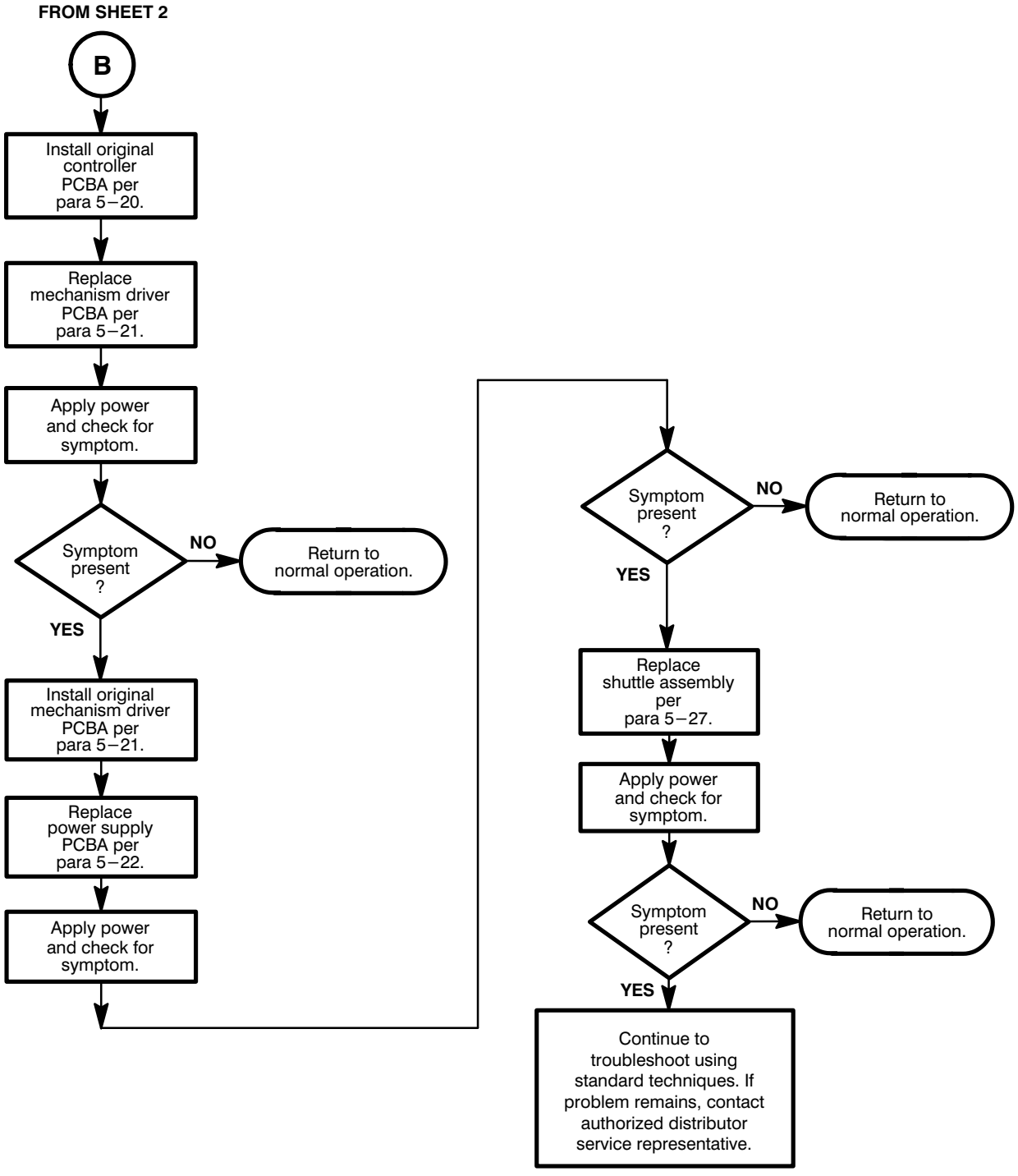

FROM SHEET 2
B
Install original controller PCBA per para 5−20.
Replace mechanism driver PCBA per para 5−21.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Install original mechanism driver PCBA per para 5−21.
Replace power supply PCBA per para 5−22.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Replace shuttle assembly per para 5−27.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Continue to troubleshoot using standard techniques. If problem remains, contact authorized distributor service representative.

Figure 4−28. Random Dropout of Dots (Sheet 3 of 3)

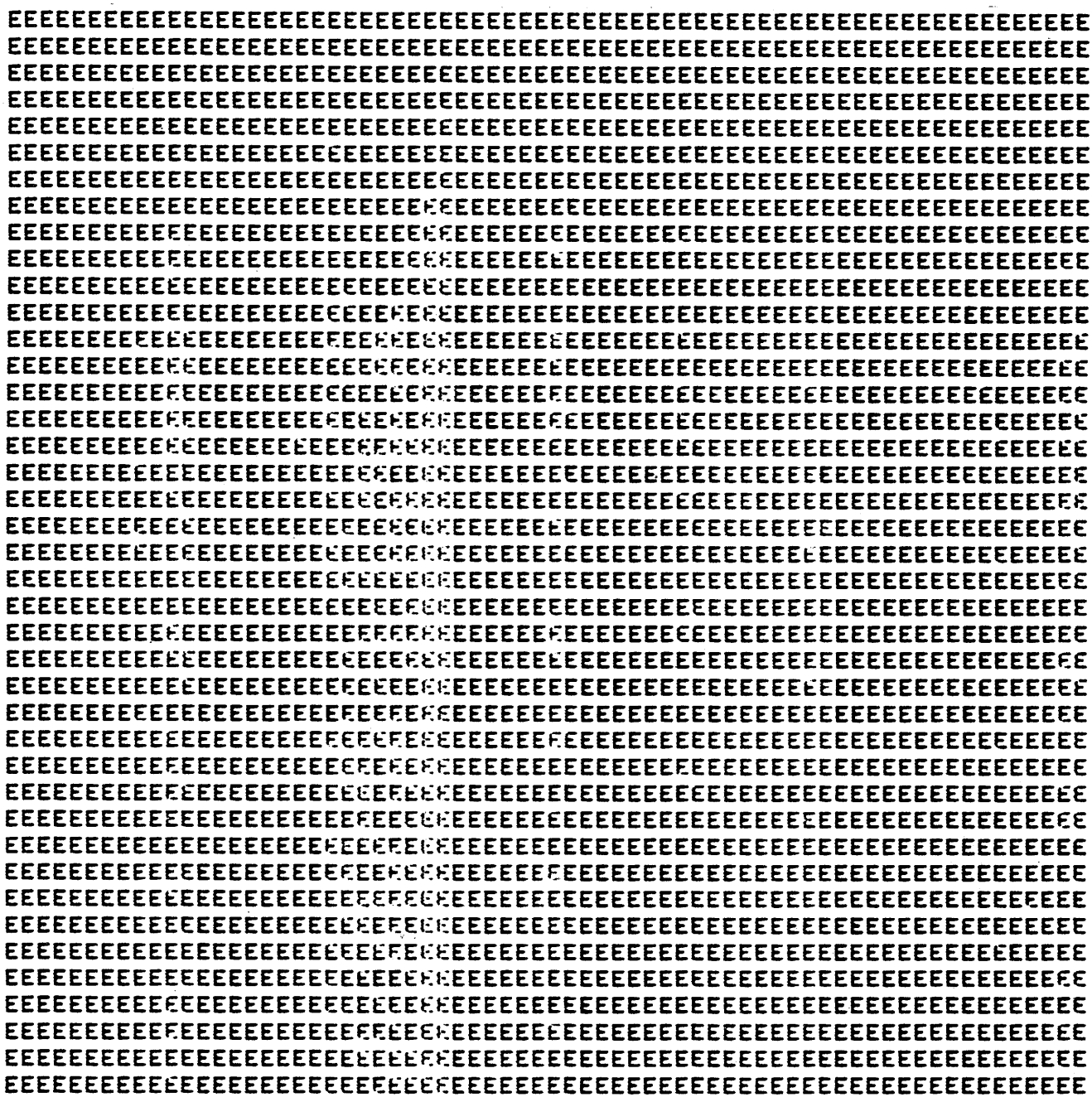


Figure 4−29. Characters Light or Smeared Example

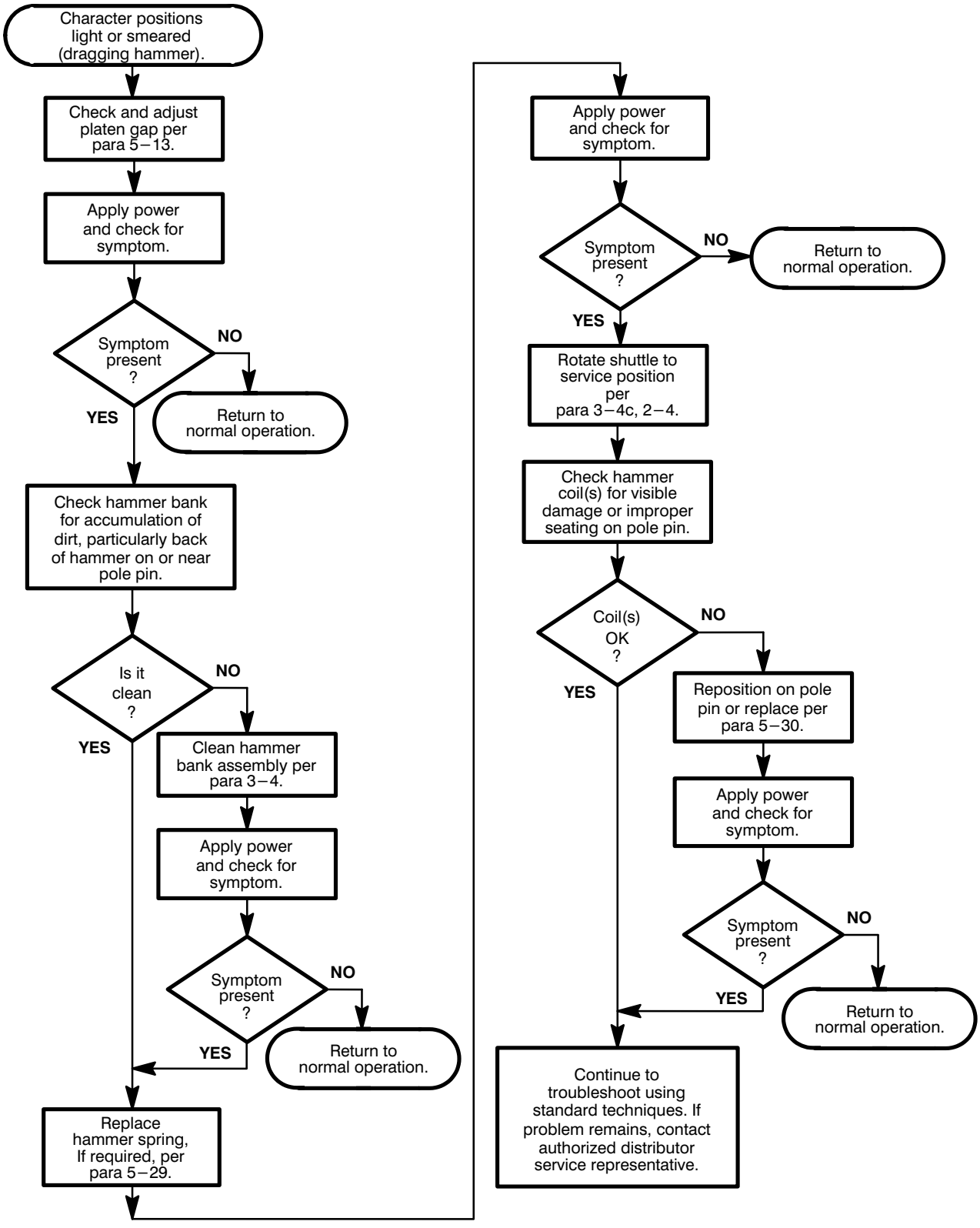

Character positions light or smeared (dragging hammer).
Check and adjust platen gap per para 5−13.
Apply power and check for symptom.
Symptom present ?
NO
YES
Return to normal operation.
Check hammer bank for accumulation of dirt, particularly back of hammer on or near pole pin.
Is it clean ?
NO
YES
Clean hammer bank assembly per para 3−4.
Apply power and check for symptom.
Symptom present ?
NO
YES
Return to normal operation.
Replace hammer spring, If required, per para 5−29.
Apply power and check for symptom.
Symptom present ?
NO
YES
Return to normal operation.
Rotate shuttle to service position per para 3−4c, 2−4.
Check hammer coil(s) for visible damage or improper seating on pole pin.
Coil(s) OK ?
NO
YES
Reposition on pole pin or replace per para 5−30.
Apply power and check for symptom.
Symptom present ?
NO
YES
Return to normal operation.
Continue to troubleshoot using standard techniques. If problem remains, contact authorized distributor service representative.

Figure 4−30. Character Positions Light or Smeared (Dragging Hammer)

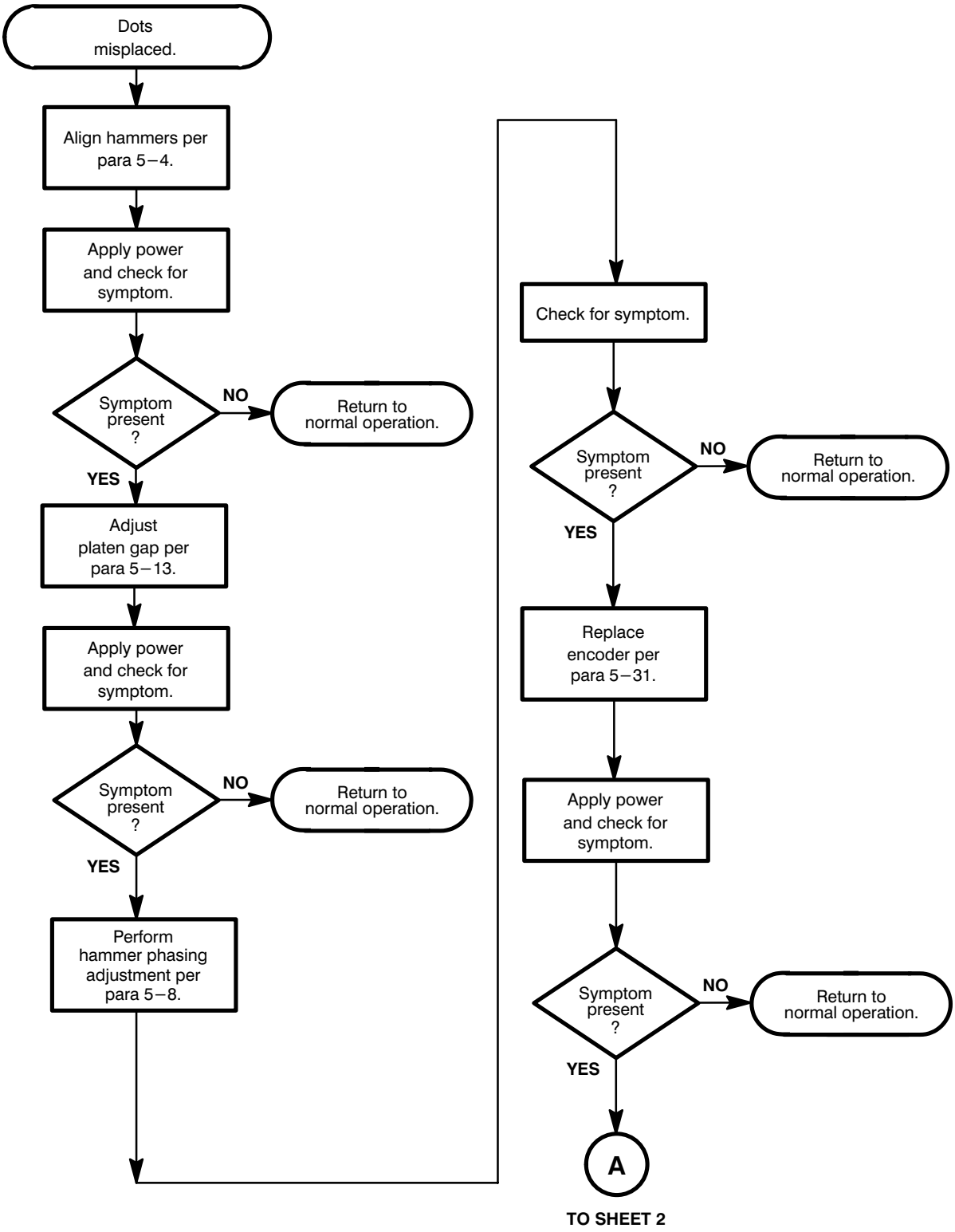


Figure 4−31. Dots Misplaced (Sheet 1 of 2)

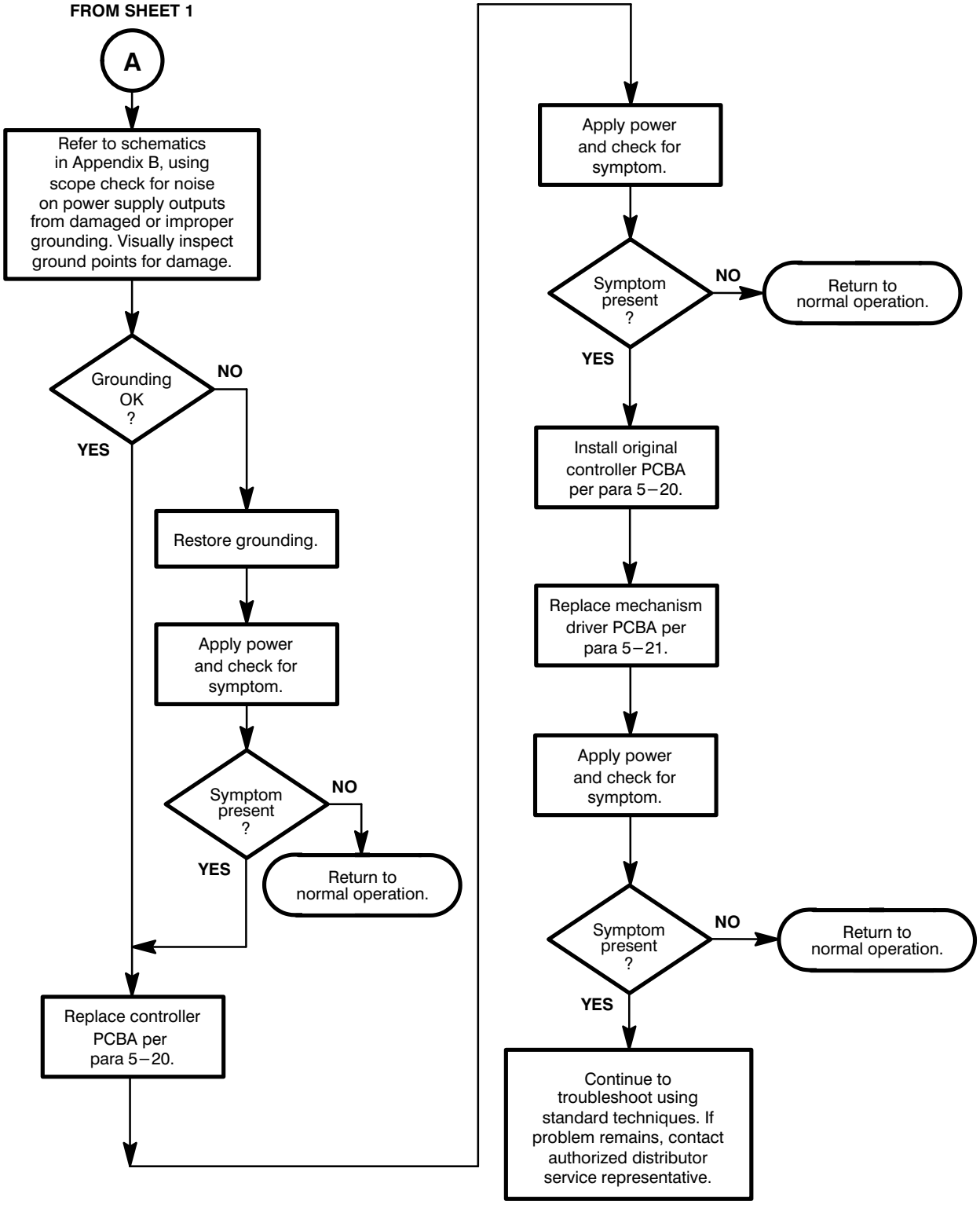

FROM SHEET 1
A
Refer to schematics in Appendix B, using scope check for noise on power supply outputs from damaged or improper grounding. Visually inspect ground points for damage.
Grounding OK ?
NO
YES
Restore grounding.
Apply power and check for symptom.
Symptom present ?
NO
YES
Return to normal operation.
Replace controller PCBA per para 5−20.
Apply power and check for symptom.
Symptom present ?
NO
YES
Return to normal operation.
Install original controller PCBA per para 5−20.
Replace mechanism driver PCBA per para 5−21.
Apply power and check for symptom.
Symptom present ?
NO
YES
Return to normal operation.
Continue to troubleshoot using standard techniques. If problem remains, contact authorized distributor service representative.

Figure 4−31. Dots Misplaced (Sheet 2 of 2)

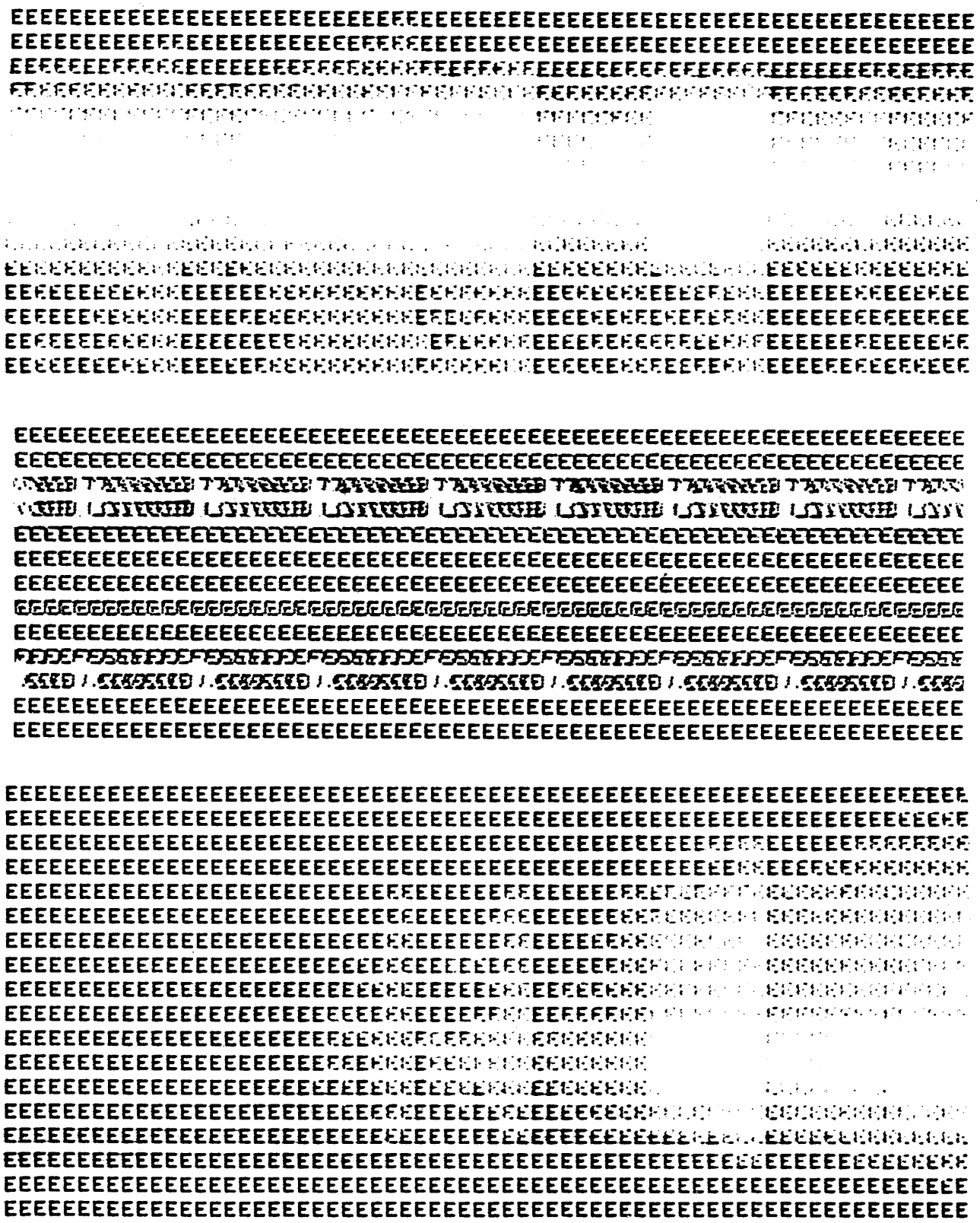


Figure 4−32. Improper Print Density Example

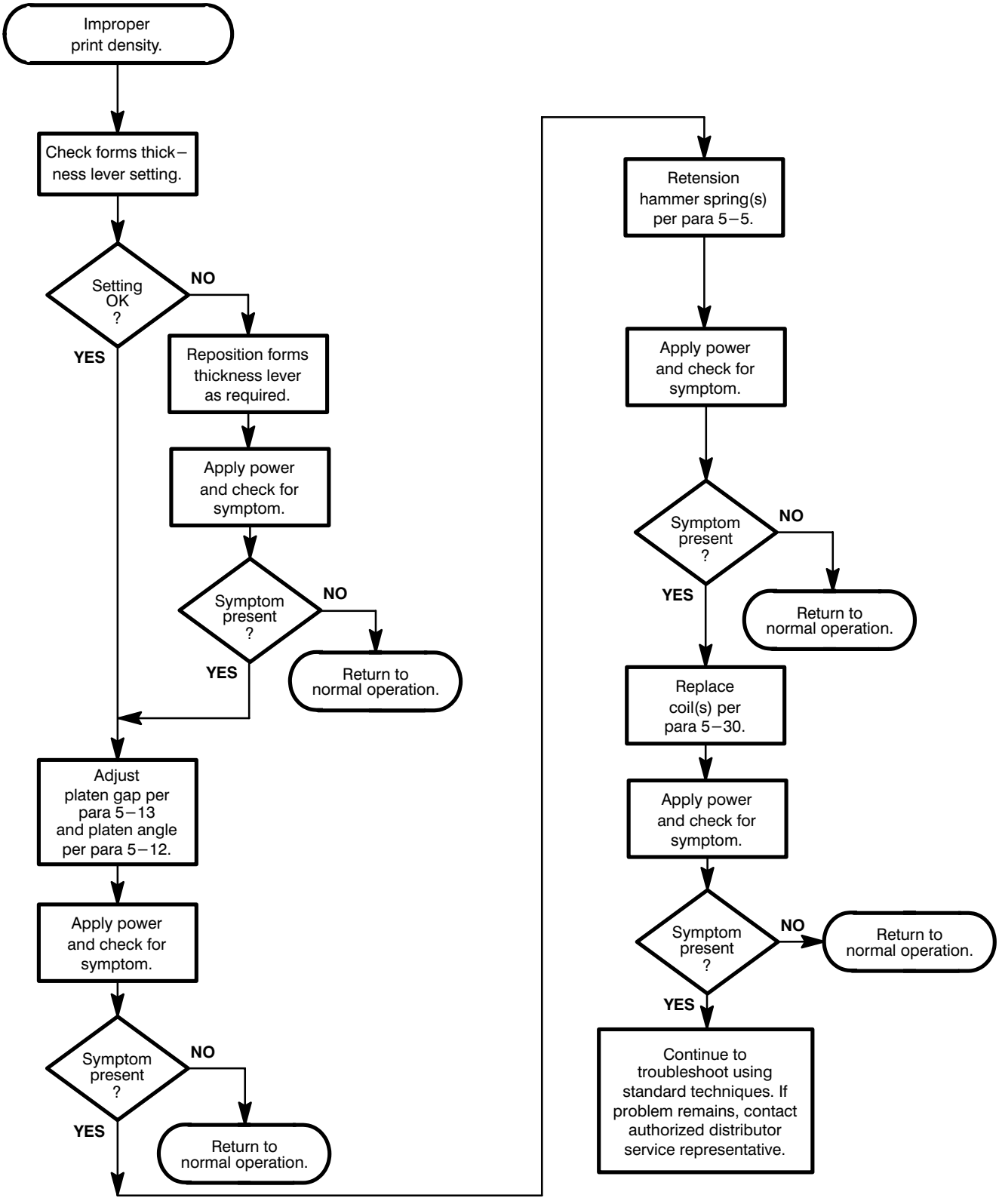
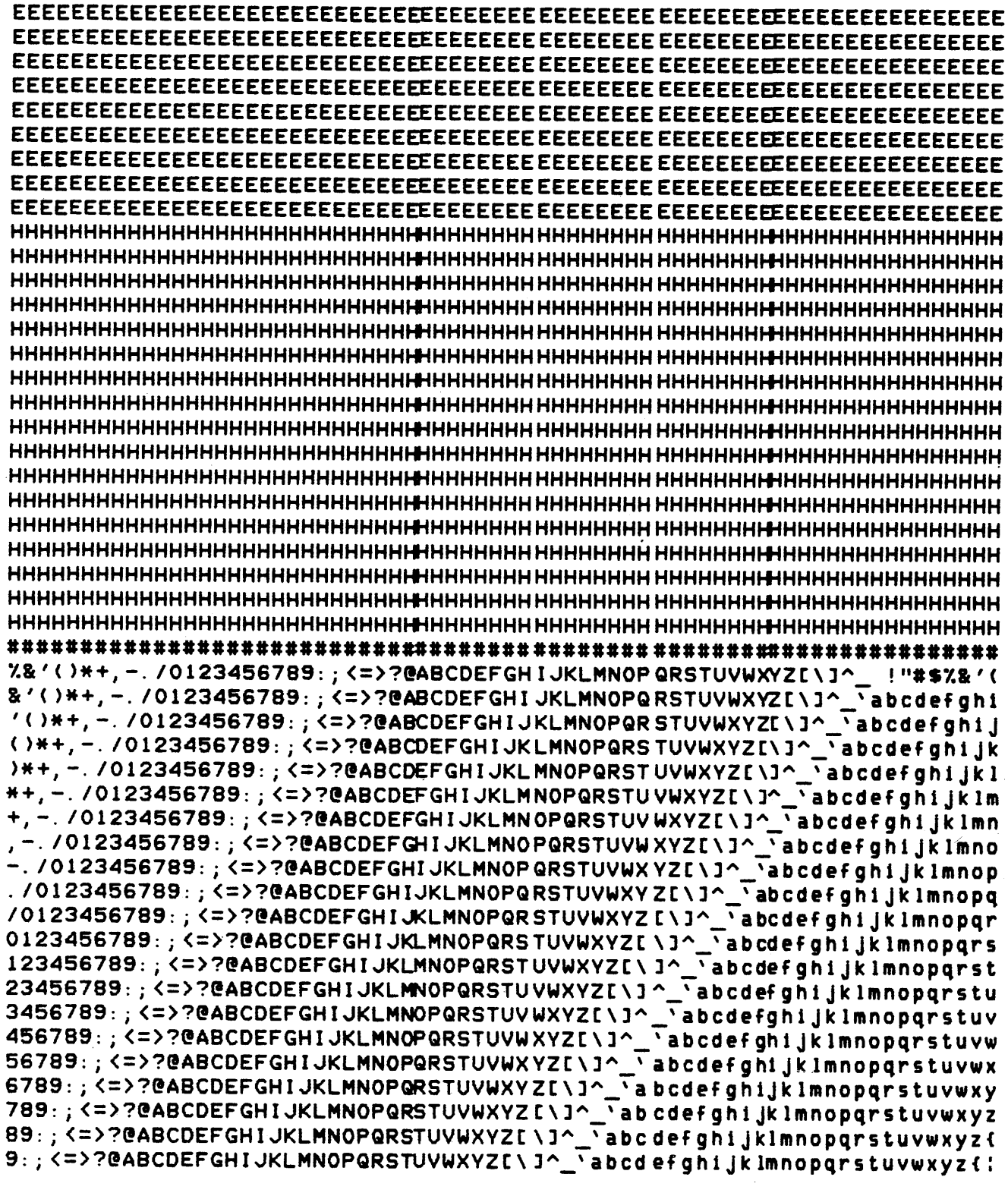


Figure 4–33. Improper Print Density


EEEE

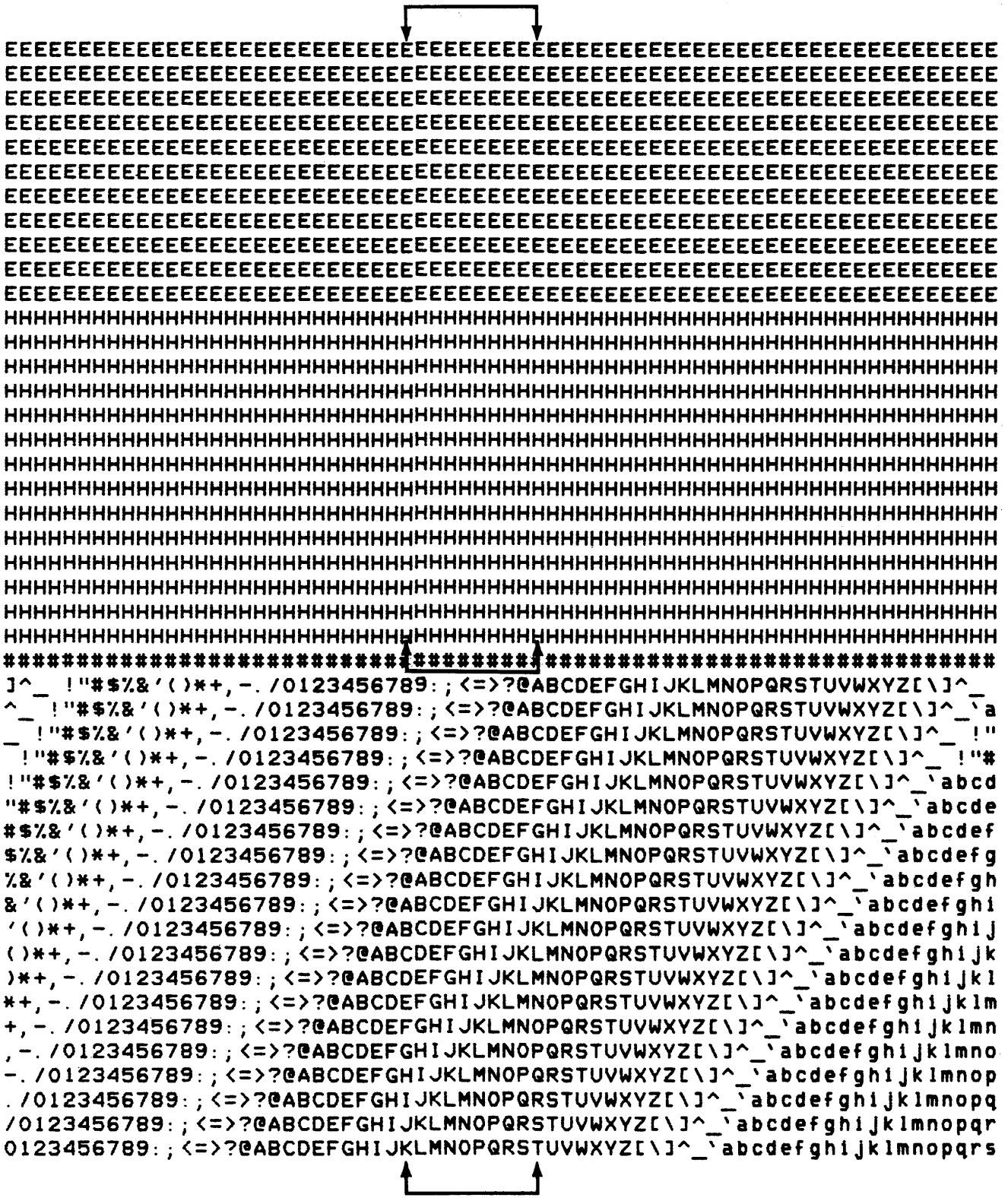


Figure 4−35. Improper Vertical Alignment Example

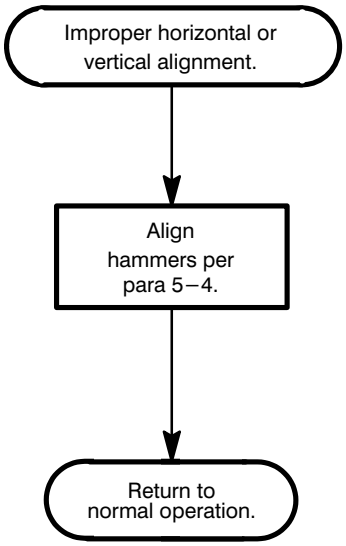


Figure 4−36. Improper Horizontal or Vertical Alignment

Figure 4−37. Characters Misformed Vertically Example

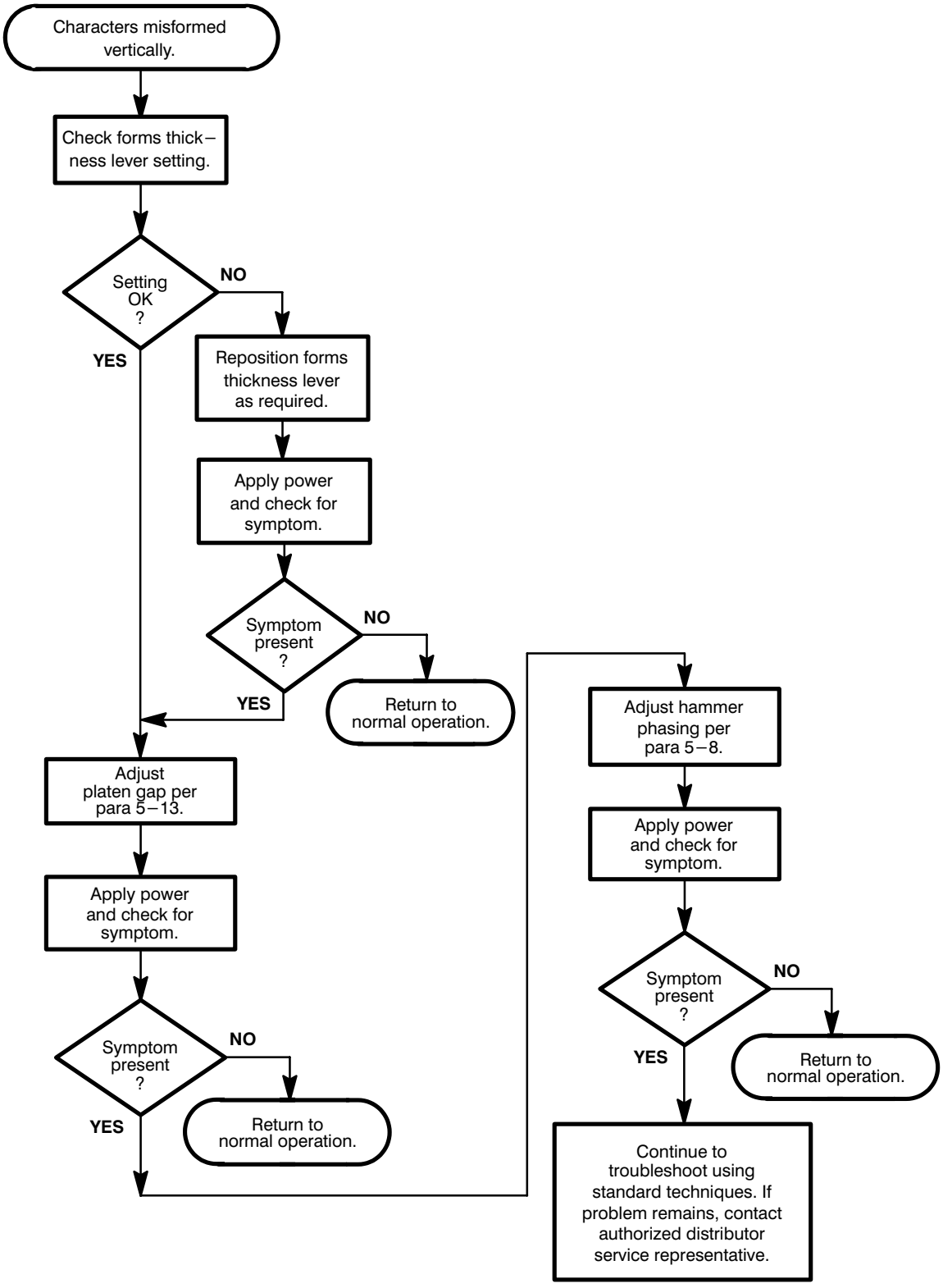
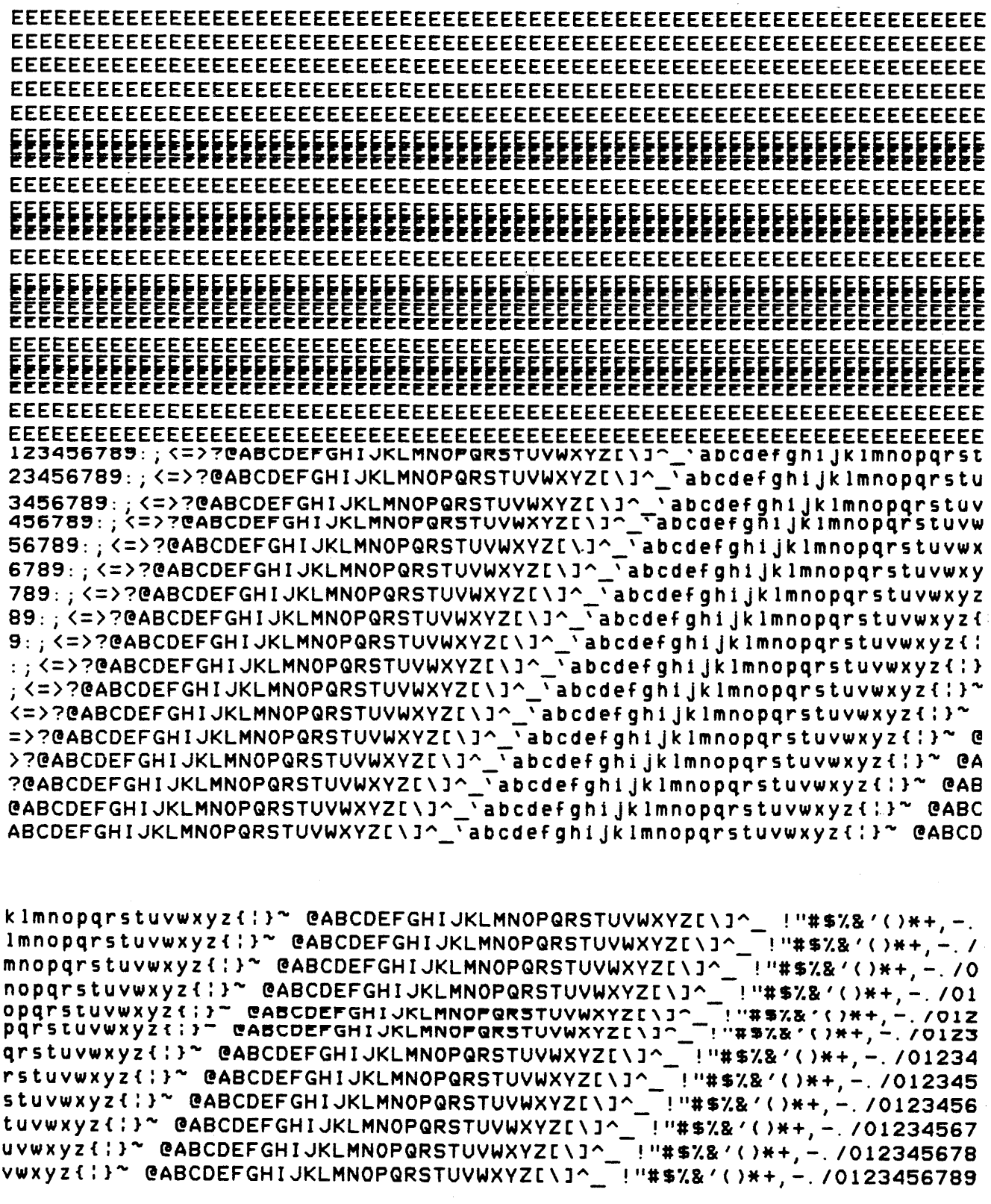


Figure 4–38. Characters Misformed Vertically


EEEE

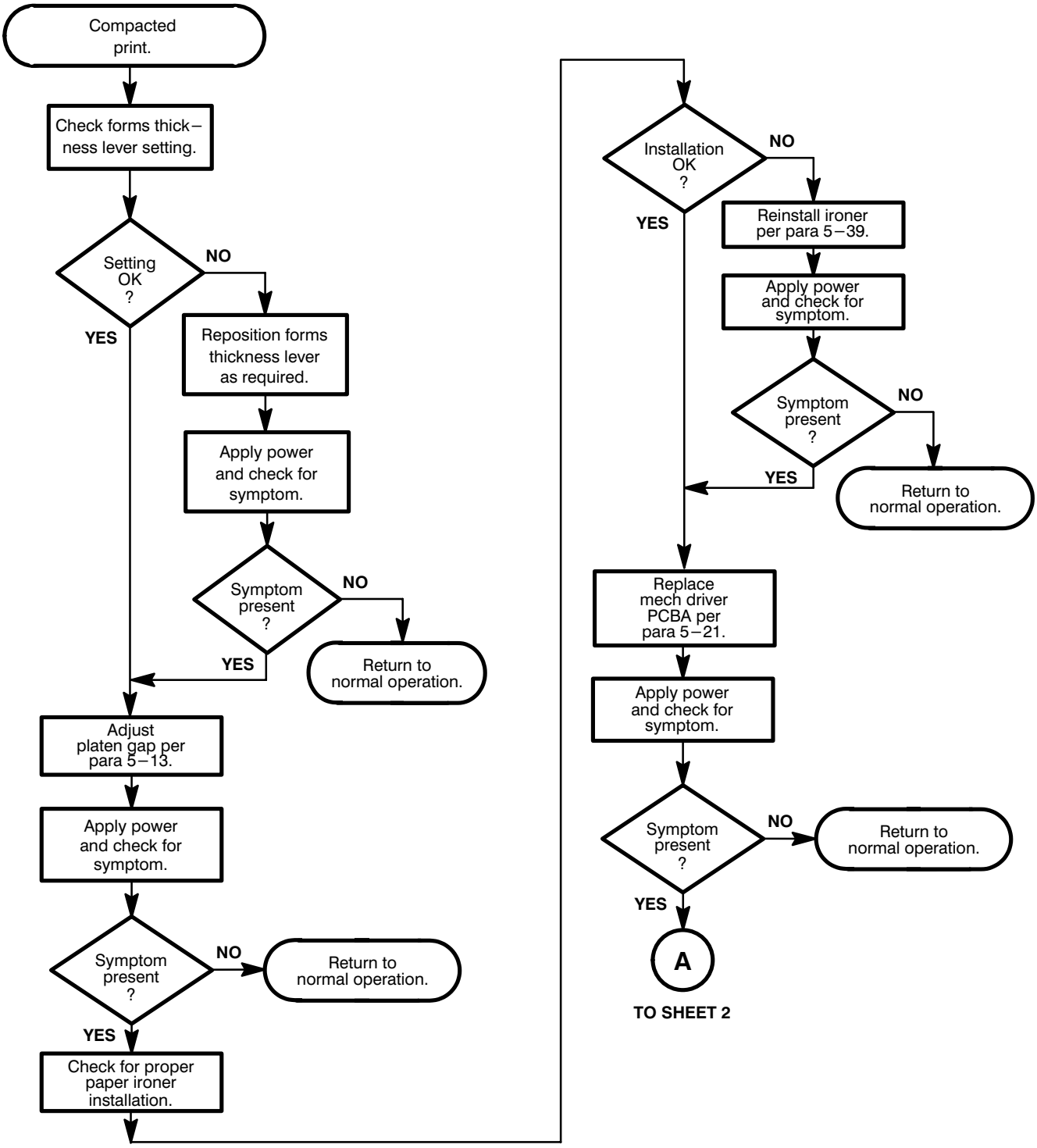


Figure 4−40. Compacted Print (1 of 2)

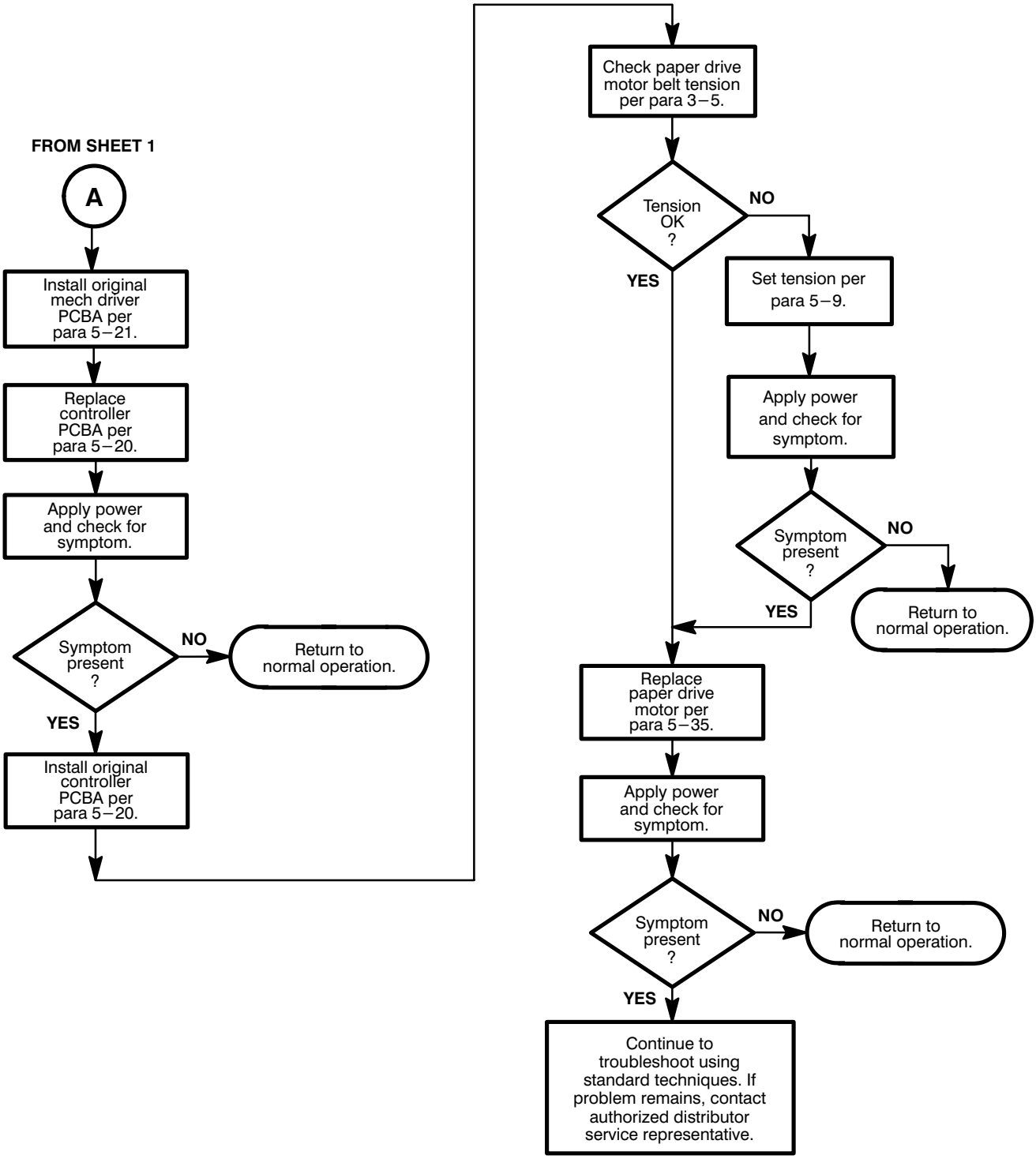

FROM SHEET 1
A
Install original mech driver PCBA per para 5−21.
Replace controller PCBA per para 5−20.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Install original controller PCBA per para 5−20.
Check paper drive motor belt tension per para 3−5.
Tension OK ?
NO
YES
Set tension per para 5−9.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Replace paper drive motor per para 5−35.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Continue to troubleshoot using standard techniques. If problem remains, contact authorized distributor service representative.

Figure 4−40. Compacted Print (2 of 2)

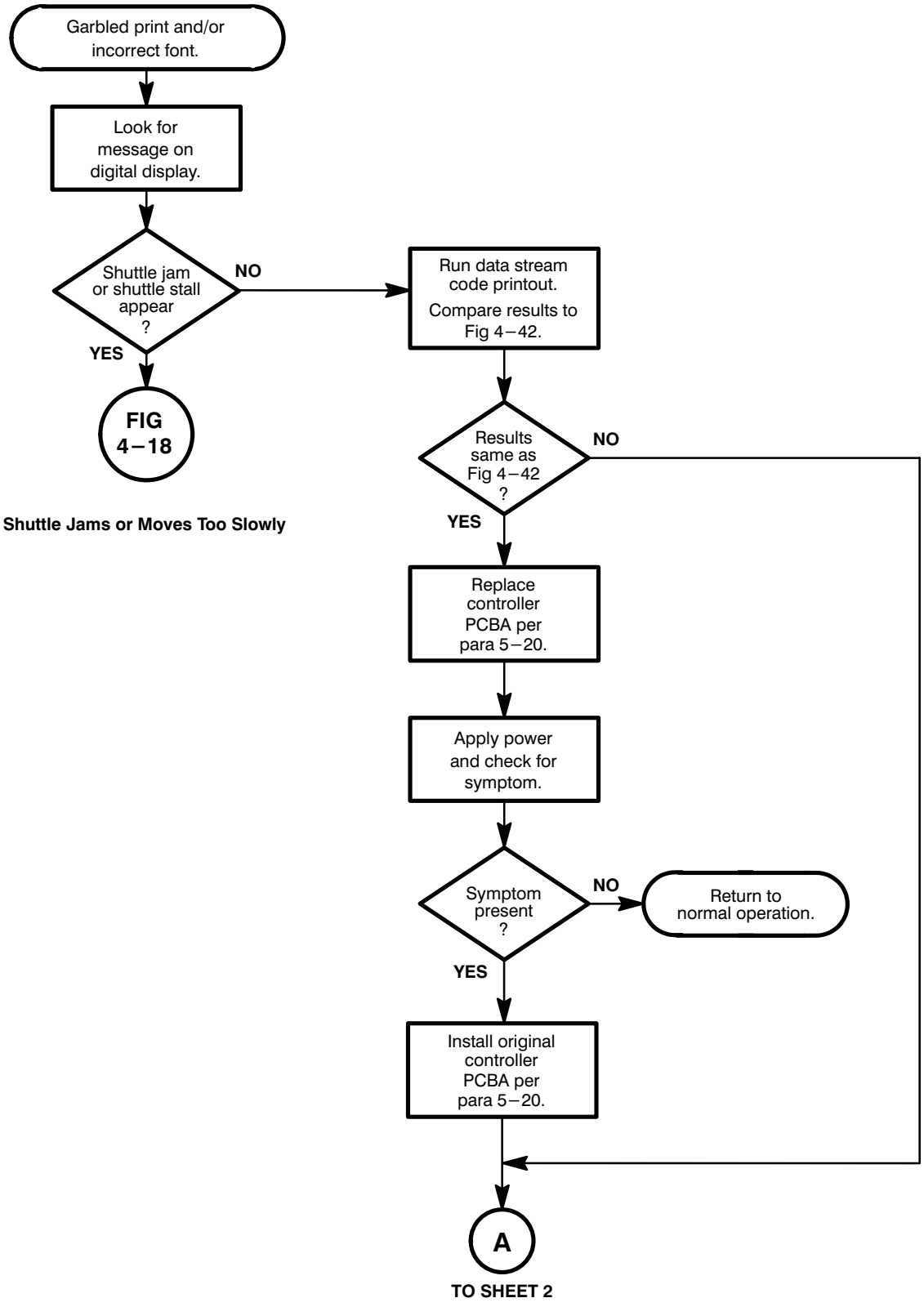


Figure 4−41. Garbled Print and/or Incorrect Font (Sheet 1 of 2)

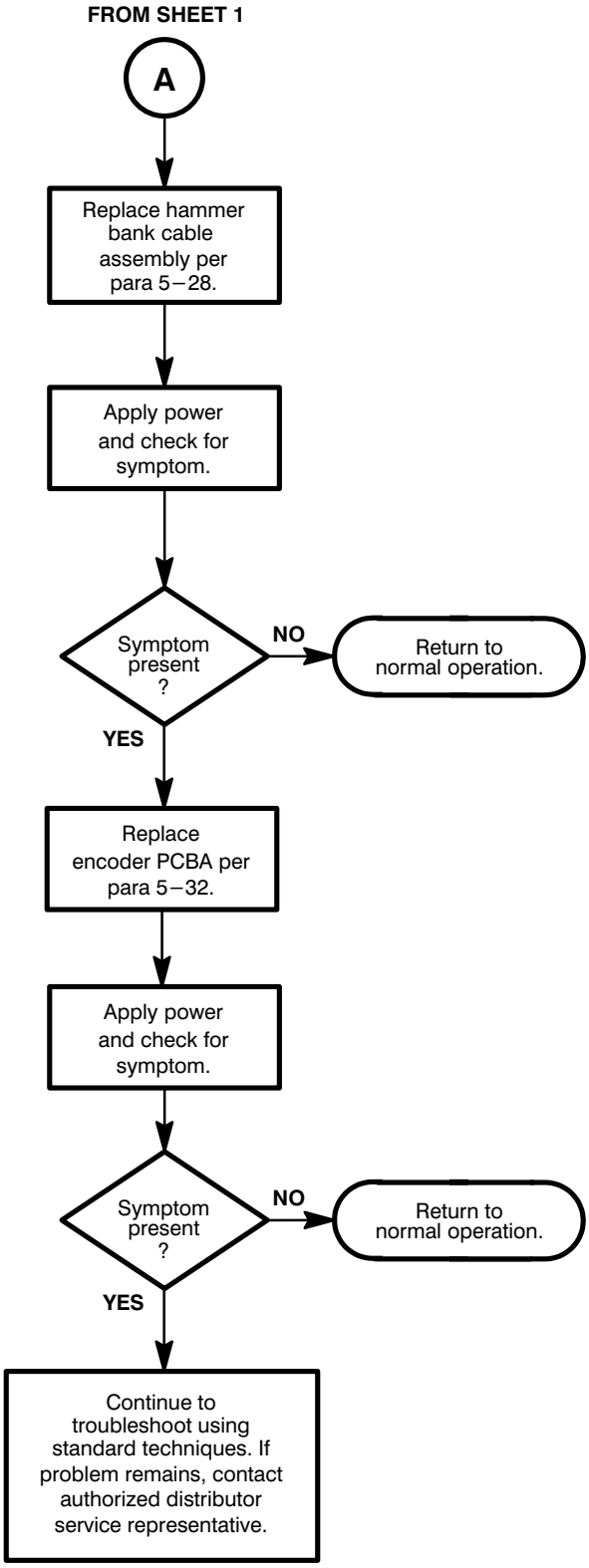

FROM SHEET 1
A
Replace hammer bank cable assembly per para 5−28.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Replace encoder PCBA per para 5−32.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Continue to troubleshoot using standard techniques. If problem remains, contact authorized distributor service representative.

Figure 4−41. Garbled Print and/or Incorrect Font (Sheet 2 of 2)

```
>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ @
?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ @A
@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ @AB
ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ @ABC
BCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ @ABCD
CDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ @ABCDE
DEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ @ABCDEF
EFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ @ABCDEFG
FGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ @ABCDEFGH
GHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ @ABCDEFGHI
HIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ @ABCDEFGHIJ
IJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ @ABCDEFGHIJK
JKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ @ABCDEFGHIJKL
KLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ @ABCDEFGHIJKLM
LMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ @ABCDEFGHIJKLMN
MNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ @ABCDEFGHIJKLMNO
NOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ @ABCDEFGHIJKLMNOP
OPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ @ABCDEFGHIJKLMNOPQ
PQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ @ABCDEFGHIJKLMNOPQR
QRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ @ABCDEFGHIJKLMNOPQRS
RSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ @ABCDEFGHIJKLMNOPQRST
STUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ @ABCDEFGHIJKLMNOPQRSTU
TUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ @ABCDEFGHIJKLMNOPQRSTUV
```

```
WXYZ[\]^_`abcdef   57 58 59 5A 5B 5C 5D 5E 5F 60 61 62 63 64 65 66 0A
XYZ[\]^_`abcdefg   58 59 5A 5B 5C 5D 5E 5F 60 61 62 63 64 65 66 67 0A
YZ[\]^_`abcdefgh   59 5A 5B 5C 5D 5E 5F 60 61 62 63 64 65 66 67 68 0A
Z[\]^_`abcdefghi   5A 5B 5C 5D 5E 5F 60 61 62 63 64 65 66 67 68 69 0A
[\]^_`abcdefghij   5B 5C 5D 5E 5F 60 61 62 63 64 65 66 67 68 69 6A 0A
\]^_`abcdefghijk   5C 5D 5E 5F 60 61 62 63 64 65 66 67 68 69 6A 6B 0A
]^_`abcdefghijkl   5D 5E 5F 60 61 62 63 64 65 66 67 68 69 6A 6B 6C 0A
^_`abcdefghijklm   5E 5F 60 61 62 63 64 65 66 67 68 69 6A 6B 6C 6D 0A
_`abcdefghijklmn   5F 60 61 62 63 64 65 66 67 68 69 6A 6B 6C 6D 6E 0A
`abcdefghijklmno   60 61 62 63 64 65 66 67 68 69 6A 6B 6C 6D 6E 6F 0A
abcdefghijklmnop   61 62 63 64 65 66 67 68 69 6A 6B 6C 6D 6E 6F 70 0A
bcdefghijklmnopq   62 63 64 65 66 67 68 69 6A 6B 6C 6D 6E 6F 70 71 0A
cdefghijklmnopqr   63 64 65 66 67 68 69 6A 6B 6C 6D 6E 6F 70 71 72 0A
defghijklmnopqrs   64 65 66 67 68 69 6A 6B 6C 6D 6E 6F 70 71 72 73 0A
efghijklmnopqrst   65 66 67 68 69 6A 6B 6C 6D 6E 6F 70 71 72 73 74 0A
fghijklmnopqrstu   66 67 68 69 6A 6B 6C 6D 6E 6F 70 71 72 73 74 75 0A
ghijklmnopqrstuv   67 68 69 6A 6B 6C 6D 6E 6F 70 71 72 73 74 75 76 0A
hijklmnopqrstuvw   68 69 6A 6B 6C 6D 6E 6F 70 71 72 73 74 75 76 77 0A
ijklmnopqrstuvwx   69 6A 6B 6C 6D 6E 6F 70 71 72 73 74 75 76 77 78 0A
jklmnopqrstuvwxy   6A 6B 6C 6D 6E 6F 70 71 72 73 74 75 76 77 78 79 0A
klmnopqrstuvwxyz   6B 6C 6D 6E 6F 70 71 72 73 74 75 76 77 78 79 7A 0A
lmnopqrstuvwxyz{   6C 6D 6E 6F 70 71 72 73 74 75 76 77 78 79 7A 7B 0A
mnopqrstuvwxyz{|   6D 6E 6F 70 71 72 73 74 75 76 77 78 79 7A 7B 7C 0A
```

Figure 4−42. Expected Data Stream Printout

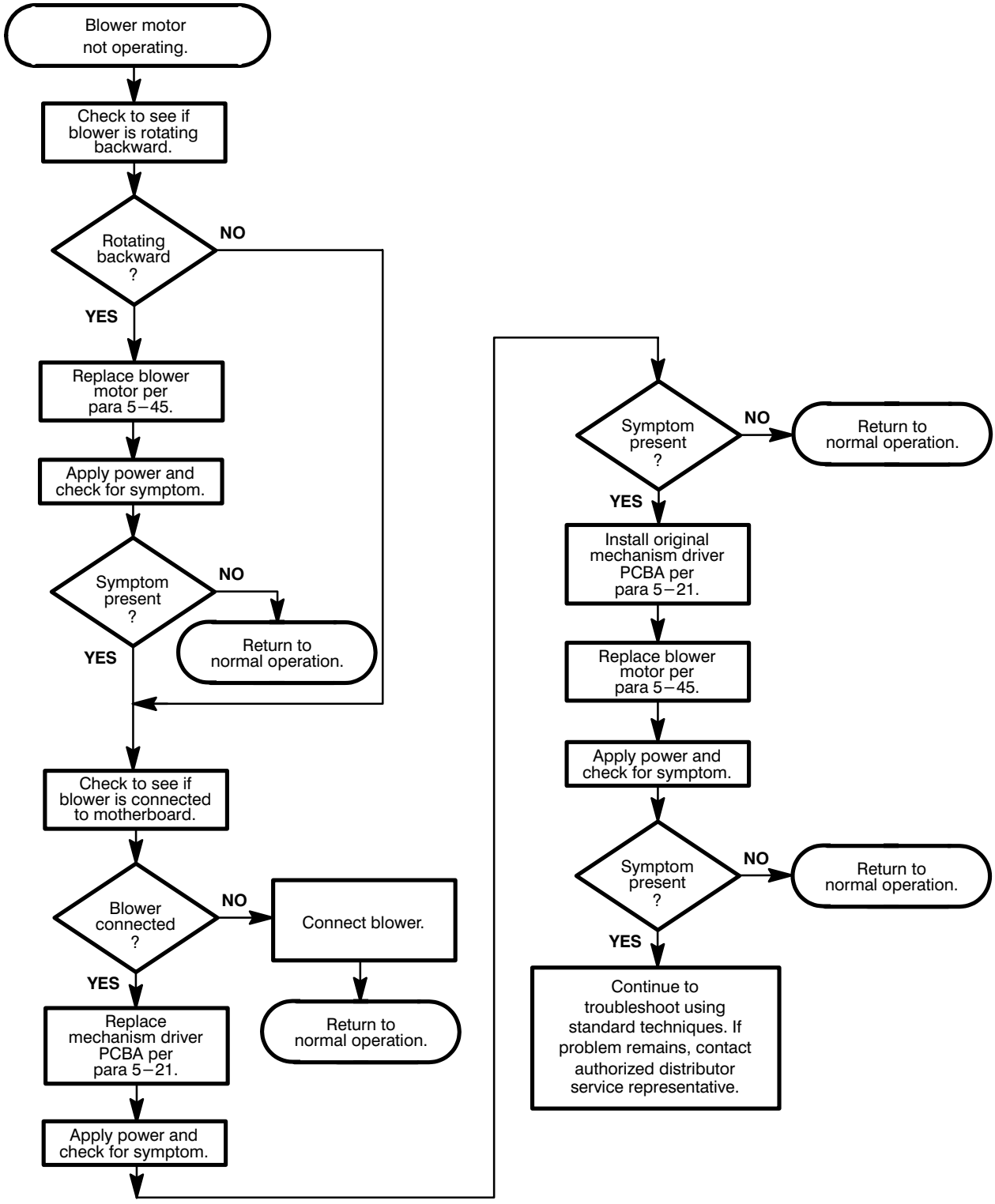

Blower motor not operating.
Check to see if blower is rotating backward.
Rotating backward ?
NO
YES
Replace blower motor per para 5−45.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Check to see if blower is connected to motherboard.
Blower connected ?
NO
Connect blower.
Return to normal operation.
YES
Replace mechanism driver PCBA per para 5−21.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Install original mechanism driver PCBA per para 5−21.
Replace blower motor per para 5−45.
Apply power and check for symptom.
Symptom present ?
NO
Return to normal operation.
YES
Continue to troubleshoot using standard techniques. If problem remains, contact authorized distributor service representative.

Figure 4−43. Blower Motor Not Operating

CHAPTER 5

CORRECTIVE MAINTENANCE

Section I. GENERAL

5−1. Introduction

Corrective maintenance at field level consists of mechanical alignments, adjustments, and replacement of printer subassemblies.

a. Alignments and Adjustments

Those items that may require field alignment or adjustment are listed below.

1. Shuttle Cover Assembly Paper Scale
2. Hammer Springs
3. Shuttle Bumpers
4. Timing Belt
5. Tractors
6. Paper Ironer
7. Platen Gap
8. Ribbon Guide Assembly

b. Replacement

The following items are field replaceable. No field repair should be attempted.

1. Controller PCBA
2. Mechanism Driver PCBA
3. Linear Encoder
4. Power Supply PCBA
5. Control Panel Assemblies
6. Encoder PCBA
7. Shuttle Assembly
8. Ribbon Drive Motors

5−1. Introduction−continued

b. Replacement−continued

9. Paper Out Switch
10. Paper Motion Detector (PMD)

5−2. Tools, Test Equipment, and Supplies

The items listed in Table 5−1 or their equivalents are required, as a minimum, to maintain the printer.

Table 5−1. Recommended Tools, Test Equipment, and Supplies

Item	Printronix Part No.	Recommended Item
Adhesive	101537−001	Eastman 910
Awl	−	−
Bumper Adjustment Tool	995762−001	−
Adjustable Wrench	−	Utica 91−4C
Diagonal Cutters	−	Erem 91EH
Digital Voltmeter	−	−
Extension 3 in, 3/8 Drive	−	−
Feeler Gauge Set	−	Proto 000AA
Hammer Tip Alignment Tool, Long	111339−001	−
Hammer Tip Alignment Tool, Short	111106−001	−
Isopropyl Alcohol	−	−
Kimwipes	−	
Nut Driver Set	−	Xcelite PS120
Oscilloscope and Probes (35 MHz or better)	−	−
Platen Angle Adjustment Tool (Optional)	995641−001	−
Pliers, Grip Ring	−	Truarc 1120
Pliers, Chain Nose	−	Erem 11DH
Ratchet, 3/8 in Drive	−	−
Rule, Steel, 6 in	−	General 616
Screwdriver, Torque, 12−36 in−lbs, Adjustable	−	Utica TS35
Adapter, Torque Screwdriver (optional)	−	Utica HW−18
Hex Bit, 3/16 in, Torque Screwdriver	−	Utica W−8
Hex Bit, 3/32 in, Torque Screwdriver	−	Utica HW−4
Hex Bit, 5/32 in, Torque Screwdriver	−	Utica HW−6
Screwdriver, Allen Hex	−	Xcelite 99PS40
Screwdriver, Phillips	−	Xcelite X100
Screwdriver, Phillips	−	Xcelite X102
Screwdriver, Slot	−	Xcelite A184
Screwdriver, Slot	−	Xcelite R3164
Screwdriver, Slot (Spring Installation Tool)	995822−001	−
Socket, 7/16 in, 3/8 in Drive	−	−
X−acto Knife and Blades	−	−

Section II. ALIGNMENTS AND ADJUSTMENTS

5−3. Paper Scale (Figure 5−1)

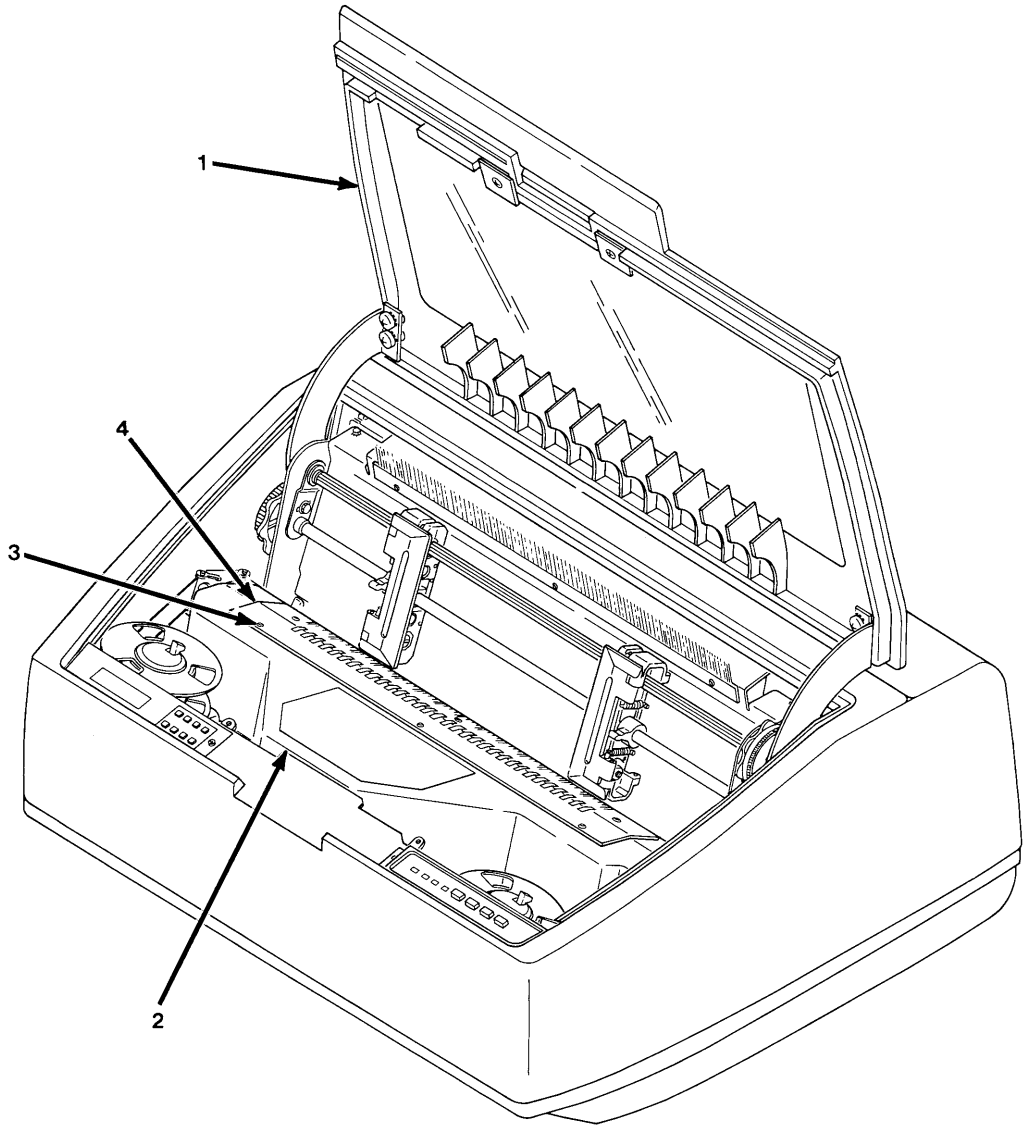
1. Open cabinet cover (1).
2. Verify shuttle cover (2) is properly installed.

   NOTE: It may be necessary to remove shuttle cover (2) when loosening and tightening screws (3).

3. Loosen six button head screws (3) slightly.
4. Position scale (4) so that positions 1 and 132 are lined up with first and last character on a 132 character printout.
5. Tighten button head screws (3).
6. Close cabinet cover (1).

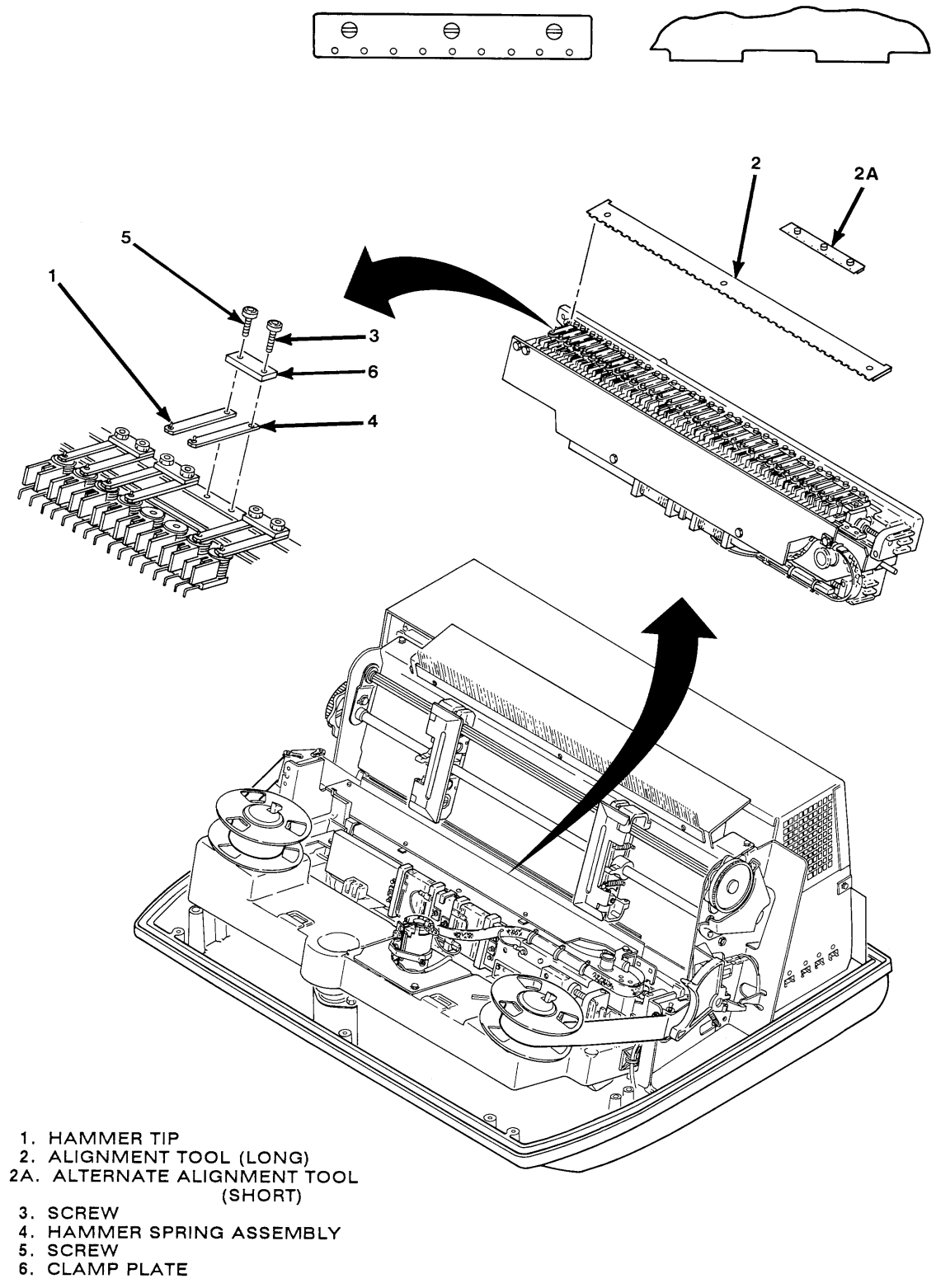
5−4. Hammer Tips (Figure 5−2)

1. Gain access to hammers by performing the procedures of paragraph 3−4c, steps 1 through 4 and 6.
2. Check alignment of hammer tips (1), by using short alignment tool (2A). Aligned tips will fit holes in tool, which will lie flat.
3. When tool fails to lie flat, take note of which hammers are misaligned and which direction they must be moved to bring them into alignment.
4. Loosen screw (3) securing misaligned hammer (4). Check that hammer can be repositioned. If not, loosen adjacent screw (5) on same clamp (6).
5. Reposition hammer and recheck alignment as required until all hammers rest in holes in the tool and the tool rests flat.
6. With tool held in position against hammers, torque screw(s) loosened in step 4 above to 12 in−lbs. Carefully remove hammer alignment tool.
7. Install hammer bank cover. Place shuttle in operating position.
8. Install shuttle cover. Load ribbon and paper.
9. Run underline test pattern per User's Reference Manual. Repeat alignment as necessary until all hammer tips are properly aligned.



1. CABINET COVER
2. SHUTTLE COVER
3. SCREW, BUTTON HEAD (6)
4. PAPER SCALE

Figure 5−1. Paper Scale Adjustment



1. HAMMER TIP
2. ALIGNMENT TOOL (LONG)
2A. ALTERNATE ALIGNMENT TOOL (SHORT)
3. SCREW
4. HAMMER SPRING ASSEMBLY
5. SCREW
6. CLAMP PLATE

Figure 5−2. Hammer Tip Alignment

5−5. Hammer Spring Retensioning (Figure 5−3)

If performance tests repeatedly show a hammer is printing too light or too dark, retension it using following procedure.

❑ CAUTION ❑

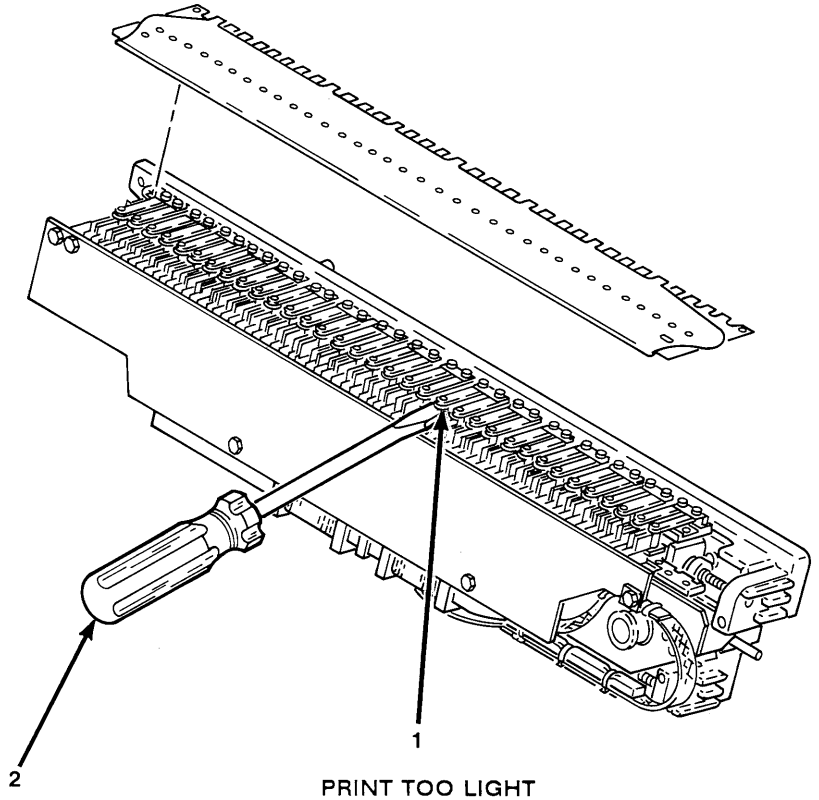
Bending too far in either direction will produce light print.

a. Print Too Light.

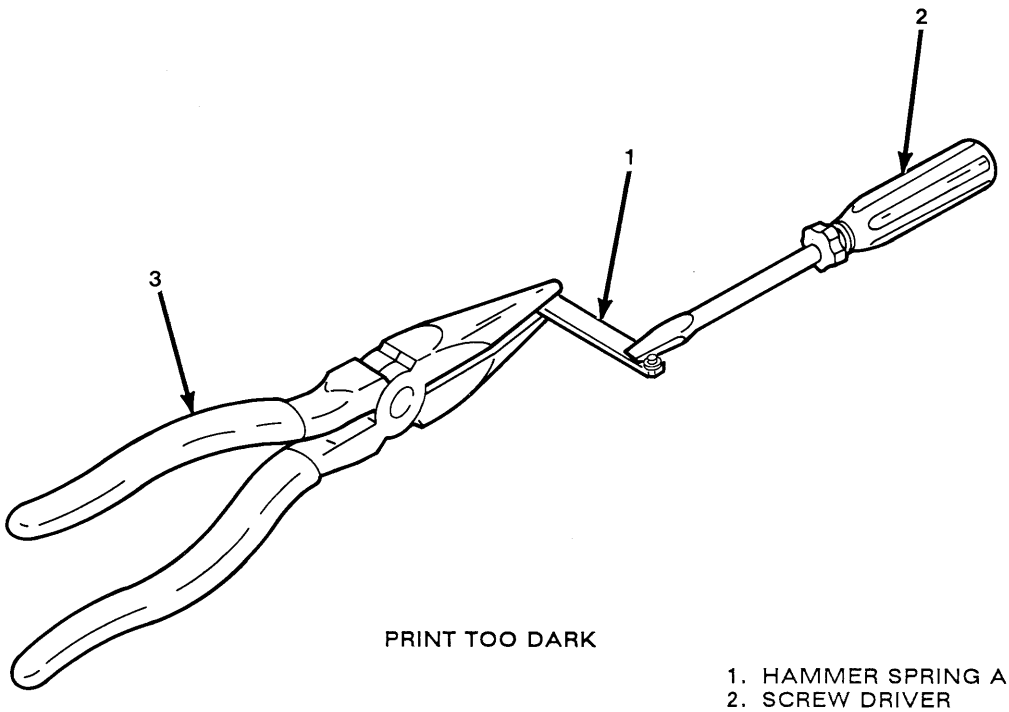
1. Open cabinet cover. Set forms thickness lever to fully open. Remove ribbon. Remove shuttle cover.
2. Rotate shuttle to service position. Carefully bend end of hammer (1) in direction indicated with tip of screwdriver (2).
3. Check print. Repeat (b) as necessary to achieve acceptable print.
4. Return shuttle to operating position. Replace shuttle cover. Close cabinet cover.

b. Print Too Dark.

1. Open cabinet cover. Remove shuttle cover. Remove ribbon.
2. Rotate shuttle to service position.
3. Remove hammer spring per paragraph 5−29a.
4. Grip spring (1) with pliers (3) across mounting hole.
5. Bend tip back slightly.
6. Install spring per paragraph 5−29b.
7. Align hammer tips per paragraph 5−4.
8. Rotate shuttle to operating position.
9. Install shuttle cover. Close cabinet.



PRINT TOO LIGHT



PRINT TOO DARK

1. HAMMER SPRING ASSEMBLY
2. SCREW DRIVER
3. PLIERS

Figure 5−3. Hammer Spring Retensioning

5−6. Bumpers (Figure 5−4)

NOTE: Bumper adjustment should be performed in conjunction with a check and adjustment of stroke timing (5−7) and hammer phasing (5−8).

a. Rough Adjustment

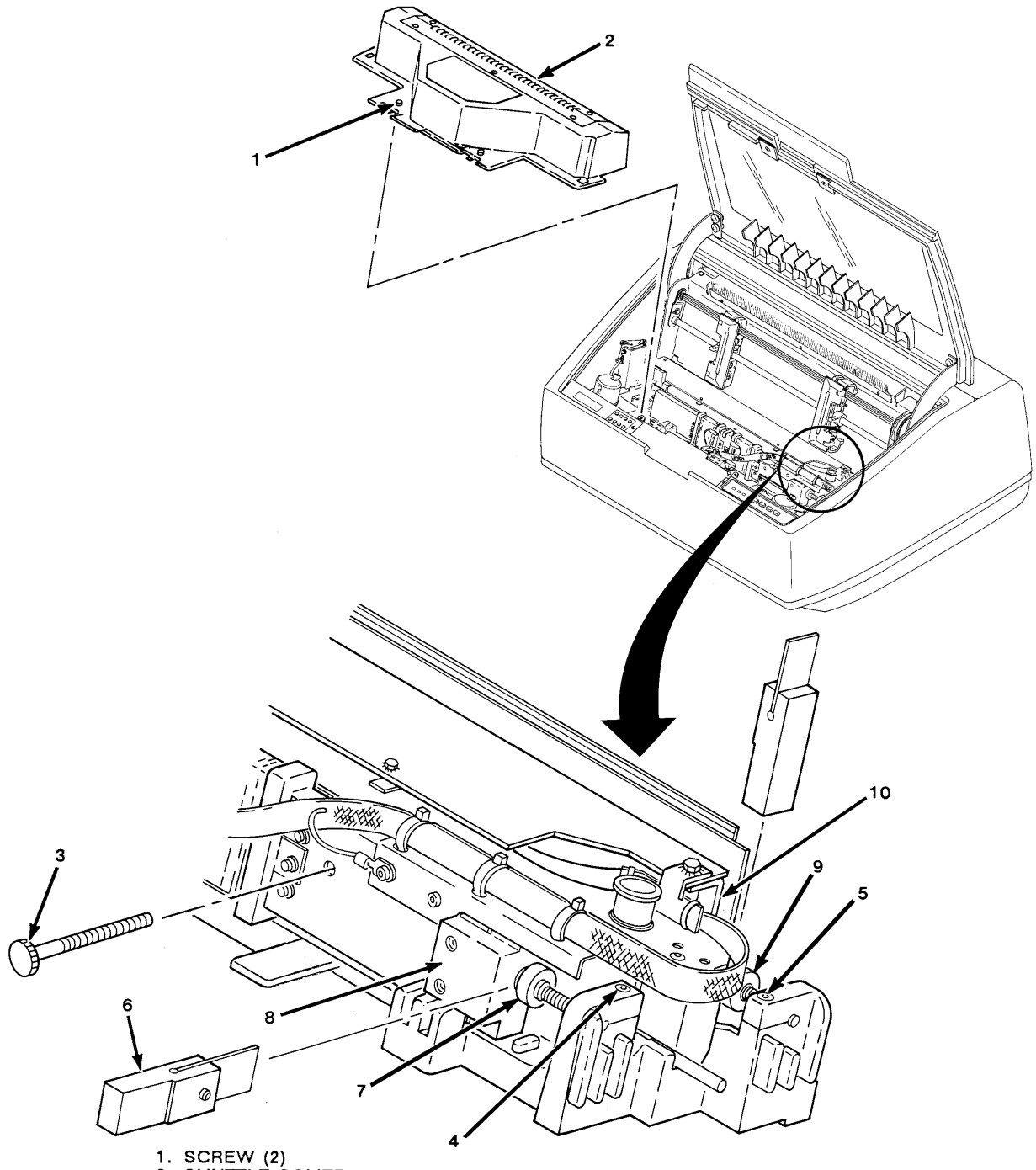
1. Turn off power.
2. Loosen two screws (1) and remove shuttle cover (2). Install shipping bolts (3).
3. Loosen clamp screws (4 and 5).
4. Insert narrow end of bumper adjusting tool (6) between front bumper (7) and rebound pad (8).
5. Adjust position of front bumper (7) until tool (6) can be removed with only slight resistance.
6. Tighten clamp screw (4)
7. Rotate hammer bank to service position.
8. Insert wide end of tool (6) between rear bumper (9) and hammer bank (10) with notch on tool toward hammer bank.
9. Adjust position of rear bumper (9) so that tool (6) can be removed with only slight resistance.
10. Tighten clamp screw (5).
11. Return hammer bank to operating position.
12. Remove shipping bolts (3). Proceed to b below.

b. Fine Adjustment

❑ WARNING ❑

Shuttle assembly will be moving forcefully against bumpers during adjustment. Do not put fingers between shuttle and bumper. Take care to grip only edge of bumper pad while rotating bumper assembly during adjustment. Do not touch linear motor cable guides.

1. Set printer power to on. Place printer offline.
2. On display control panel, press DOWN, PREV, DOWN, PREV, DOWN, NEXT.



1. SCREW (2)
2. SHUTTLE COVER
3. SHIPPING BOLT (2)
4. LOCKSCREW, FRONT BUMPER
5. LOCKSCREW, REAR BUMPER
6. BUMPER ADJUSTING TOOL
7. BUMPER, FRONT
8. REBOUND PAD
9. BUMPER, REAR
10. HAMMER BANK

Figure 5−4. Bumper Adjustment

5−6. Bumpers−continued

b. Fine Adjustment−continued

3. Press R/S. Printer motion will start and display will show:

   HAMMERBANK INDEX XXX

   MOTORBAR INDEX XXX

4. Observe display. If HAMMERBANK INDEX is not 40 ± 2:

   (a) Loosen clamp screw (5).

   (b) Reposition rear bumper (9) until HAMMERBANK INDEX is 40 ± 2.

   (c) Tighten clamp screw (5).

5. Observe display. If MOTORBAR INDEX is not 40 ± 2:

   (a) Loosen clamp screw (4).

   (b) Reposition front bumper (7) until MOTORBAR INDEX is 40 ± 2.

   (c) Tighten clamp screw (4).

6. Press R/S then CLEAR.

7. Install shuttle cover (2). Tighten two screws (1).

5−7. Stroke Timing

NOTE: Stroke timing should be checked and adjusted in conjunction with bumper adjustment (5−6) and hammer phasing (5−8).

1. On display control panel, press DOWN, PREV, DOWN, PREV and DOWN.

2. Stroke timing is defined as half of period of shuttle movement. When display indicates STROKE TIME, press R/S once. Shuttle motion will begin and STROKE TIME will be displayed.

3. Observe display:

   (a) If it indicates 25.0 ±±0.2, go to step 4.

   (b) If not, readjust bumpers by selecting a new rebound rate. Values less than 25.0 will decrease bumper adjustment and values greater will increase it.

4. Press R/S switch. Shuttle motion will stop.

5−8. Hammer Phasing

NOTE: Hammer phasing should be checked and adjusted in conjunction with bumper adjustment (5−6) and stroke timing (5−7) and must be repeated for each print mode. It must be checked and adjusted, if necessary, when controller or DCU PROMs are replaced, or if display shows FACTORY PARAMETER LOADED.

1 On display control panel, Press DOWN, PREV, DOWN, PREV, DOWN and PREV.

2. Press R/S. Printing of all H's will begin and current phasing index value will appear on the display. Index range is between −99 and +99.

3. Observe print quality. Use NEXT or PREV to change phasing value (printed at beginning of each line). When acceptable print is obtained, press R/S to stop the text and store the phasing value selected. R/S may also be used to restart the test if required.

   NOTE: Each time NEXT is pressed, the index value increases. Each time PREV is pressed, the index value decreases.

4. Repeat 1 through 3 for each print mode.

5−9. Timing Belt Tension Adjustment (Figure 5−5)

1. Check tension per paragraph 3−5a 1, steps 1 through 4.
2. Loosen two hex screws (1) holding motor (2) against side plate (3).
3. Apply tension to motor shaft to tighten belt (4).
4. While maintaining tension, tighten two hex screws (1) to 32 ± 2 in−lbs.
5. Verify 1/16 inch deflection of belt (4). Repeat adjustment if necessary.
6. Install timing belt shield (5), two screws (6), and washers (7).
7. Install cabinet per paragraph 5−15b.

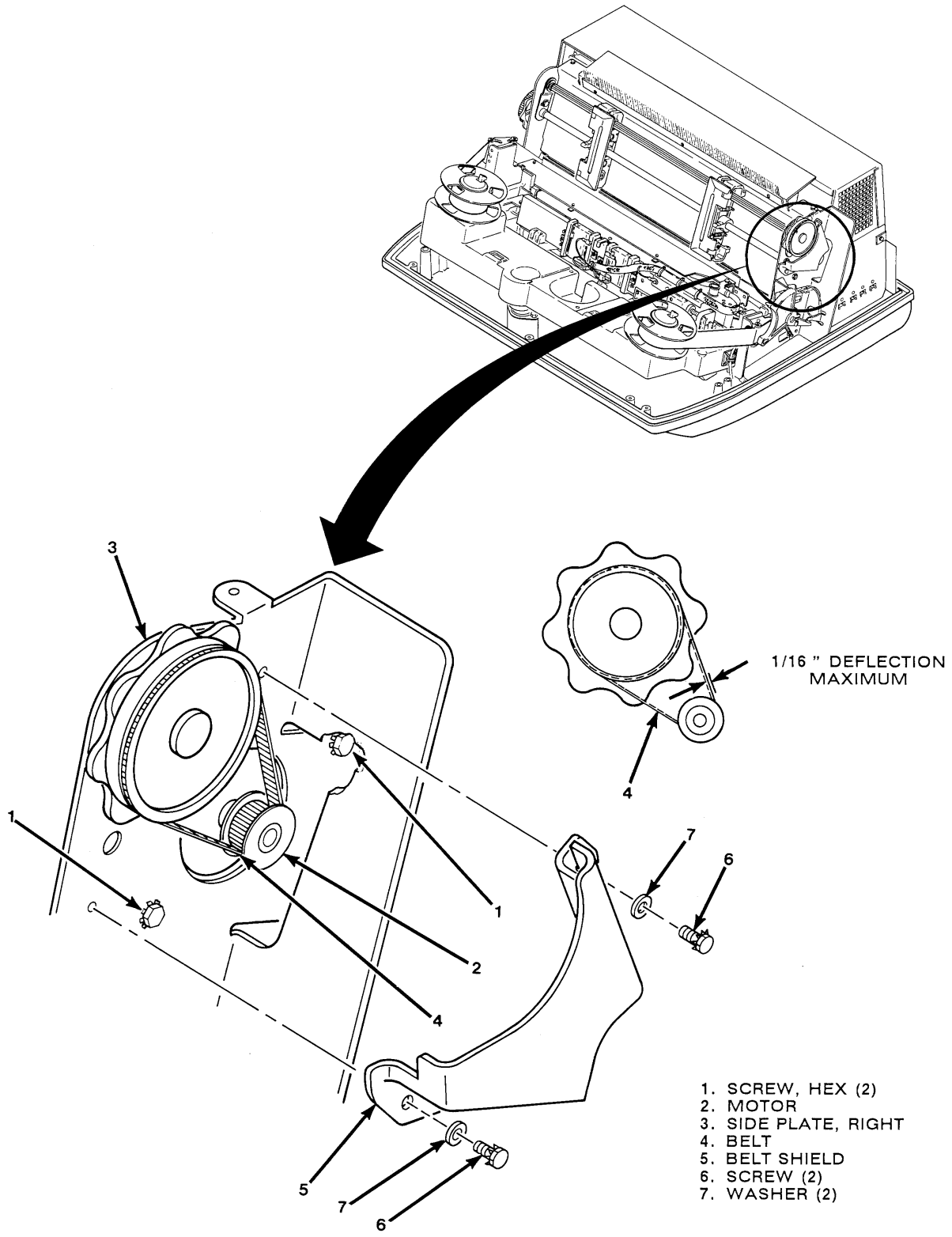


Figure 5−5. Timing Belt Adjustment

5−10. Paper Drive Motor Pulley Alignment (Figure 5−6)

1. Remove cabinet per paragraph 5−15a.
2. Remove two screws (1) and washers (2).
3. Separate belt shield (3) from side plate (4).
4. Loosen two set screws (5) on motor pulley (6).
5. Align motor pulley (6) to spline shaft pulley (7). Tighten set screws (5).
6. Check tracking by doing several top of form operations and observing belt action.
7. Place belt shield (3) on side plate (4).
8. Install two screws (1) and washers (2).
9. Install cabinet per paragraph 5−15b.

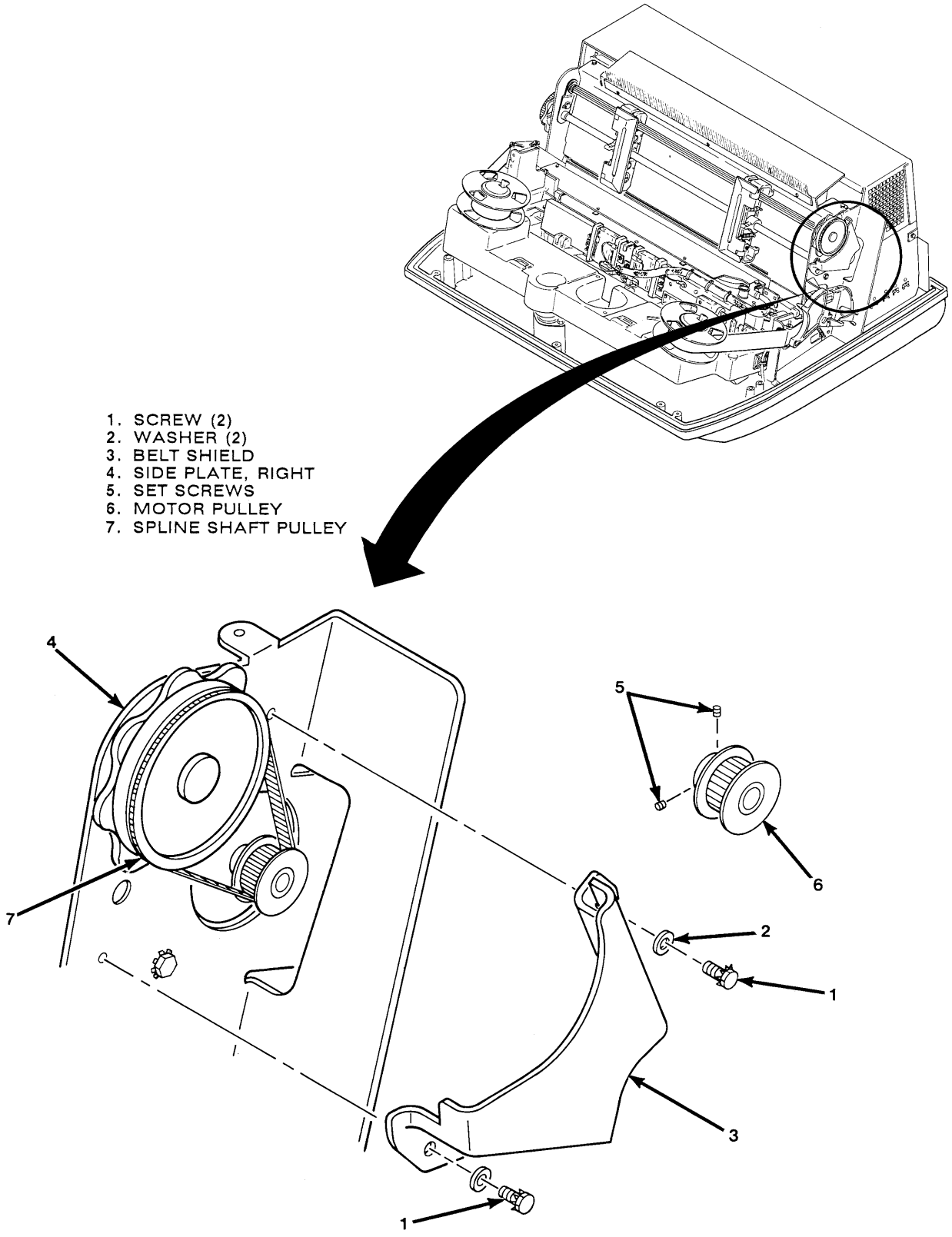
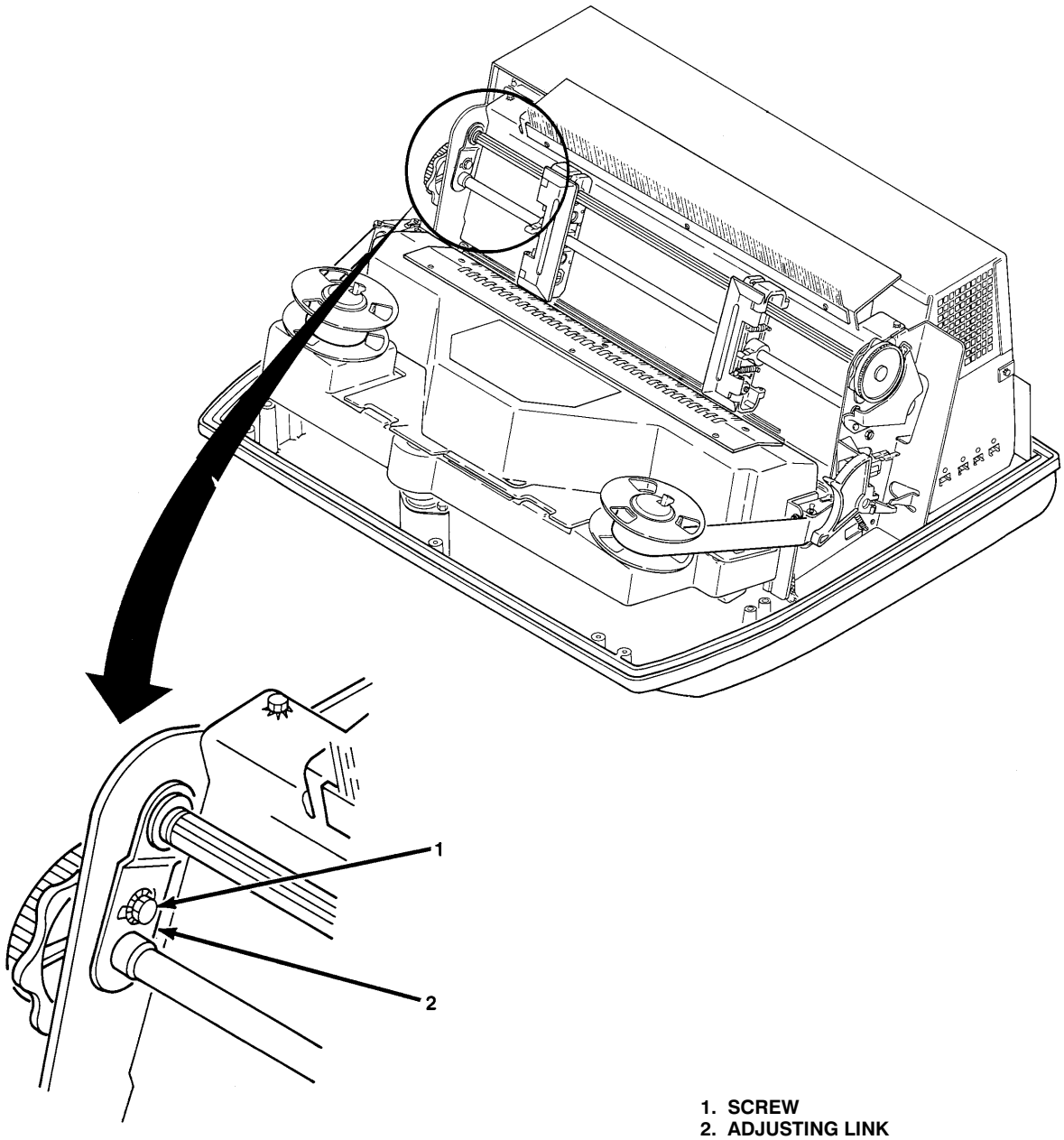


Figure 5−6. Paper Drive Motor Pulley Alignment

5−11. Spline Shaft Skew Adjustment (Figure 5−7)

If lines of print are not parallel with perforations on paper, perform the following adjustment.

1. Loosen screw (1) securing adjusting link (2).
2. Adjust link (2) to obtain print parallel with perforations. Tighten screw (1). Check results by printing Es.



1. SCREW
2. ADJUSTING LINK

Figure 5−7. Spline Shaft Skew Adjustment

5−12. Platen Angle Adjustment (Figure 5−8)

a. Preferred Method (with alignment tool).

1. Remove paper from printer. Remove cabinet per paragraph 5−15a.
2. Loosen two captive screws (1) and remove shuttle cover (2).
3. With Forms Thickness Adjustment Lever (3) fully closed, check angle of platen (4) using 995641−001, platen angle tool (5).
4. If angle is correct, stop. No adjustment is necessary.
5. If angle is incorrect, loosen clamp screw (6) and setscrew (7).
6. Reposition platen (4) to correct angle.
7. Slide platen (4) to right and forms thickness lever (3) to left to remove end play. Ensure Forms Thickness Lever is fully closed. Tighten clamp screw (6) and then setscrew (7).
8. Install shuttle cover (2). Tighten two captive screws (1).
9. Install cabinet per paragraph 5−15b.

b. Alternate Method (without alignment tool).

❑ CAUTION ❑

This procedure exposes hammer tips to possible damage and is less accurate than the preferred method. Exercise care when performing this procedure.

1. Perform steps 1 and 2 of a, above.
2. With the Forms Thickness Lever (3) fully closed, check distance from top of hammer tip to top edge of platen using six−inch steel rule−see detail A.
3. Is dimension correct?
   (a) If yes, proceed to step 5.
   (b) If no, loosen clamp screw (6) and setscrew (7) and reposition platen as necessary.
4. Perform step 7 of a, above.
5. Perform steps 8 and 9 above.

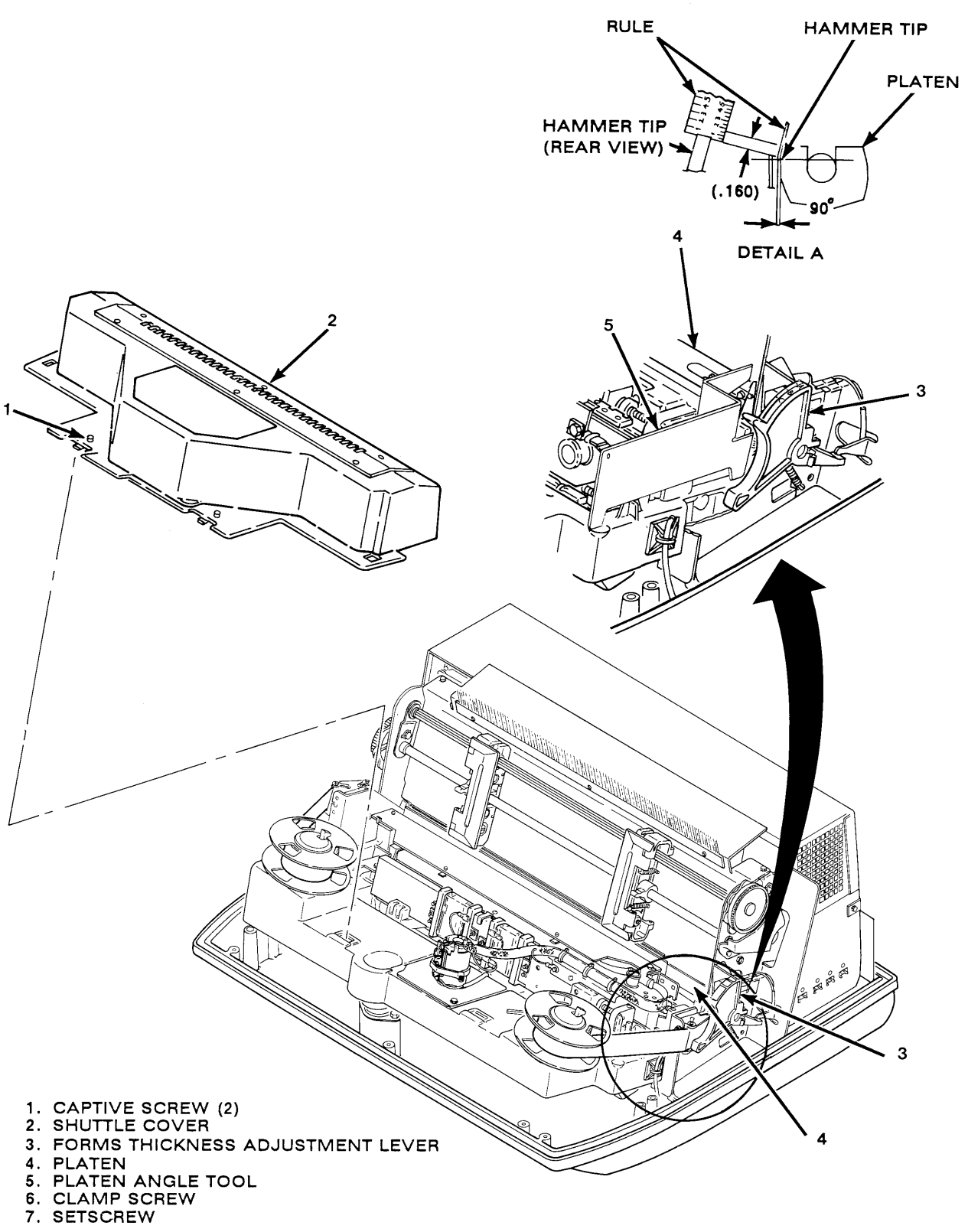


Figure 5−8. Platen Angle Adjustment (1 of 2)

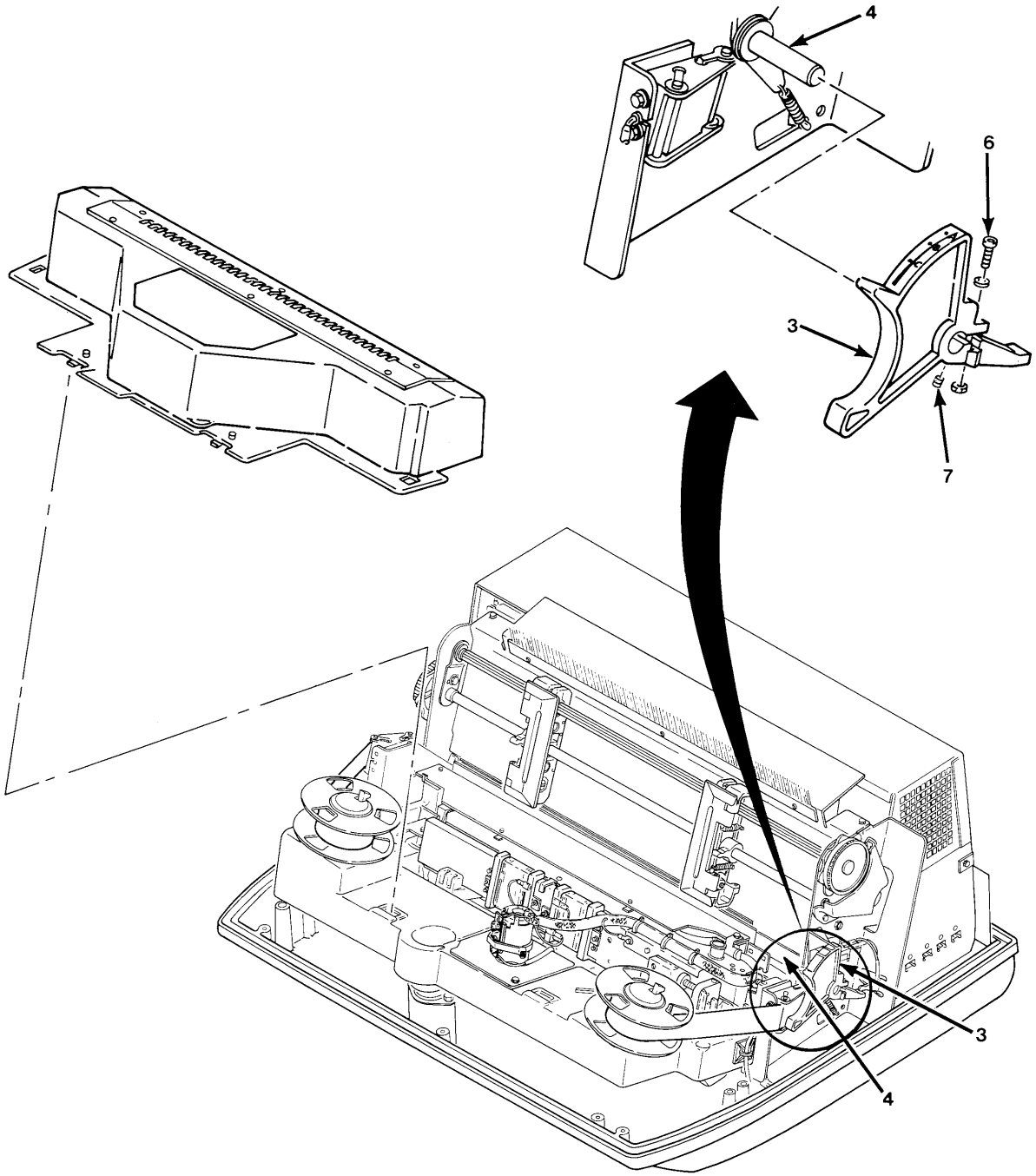


Figure 5−8. Platen Angle Adjustment (2 of 2)

5−13. Platen Gap Adjustment (Figure 5−9)

NOTE: Nominal setting for platen gap is 0.012 ± .001 inch.

1. Open cover (1).
2. Raise forms thickness lever (2) to open position and remove paper.
3. Gain access to shuttle and remove hammer bank cover per paragraph 5−29a, steps 1 through 5.
4. Remove paper ironer per paragraph 5−39a.
5. Rotate shuttle (3) to operating position. Check platen angle per paragraph 5−12.

❑ **CAUTION** ❑

Do not force platen against feeler gauge. Damage to printer will result.

6. Insert 0.012 in flat feeler gauge (4) between platen (5) and hammer tips (6) within four hammer positions of end of hammer bank.
7. Carefully close forms thickness lever (2) until hammer tips and platen contact feeler gauge. With lever closed, gauge should contact both tips and platen and move with very little friction. Shift gauge slightly to verify.
8. Repeat 5 through 7 at other end of hammer bank and four hammers in the middle−−two on each side of support pin.
9. Readjust gap as required by manipulating set screws (7), located at each end of platen (5). Check gap at both ends and center after each adjustment.
10. When adjustment is correct, install paper ironer per paragraph 5−39b.
11. Install hammer bank cover per 3−4c, steps 10 and 11.
12. Install shuttle cover per paragraph 5−23b. Install ribbon and paper.
13. Print repeating Hs to check print quality.

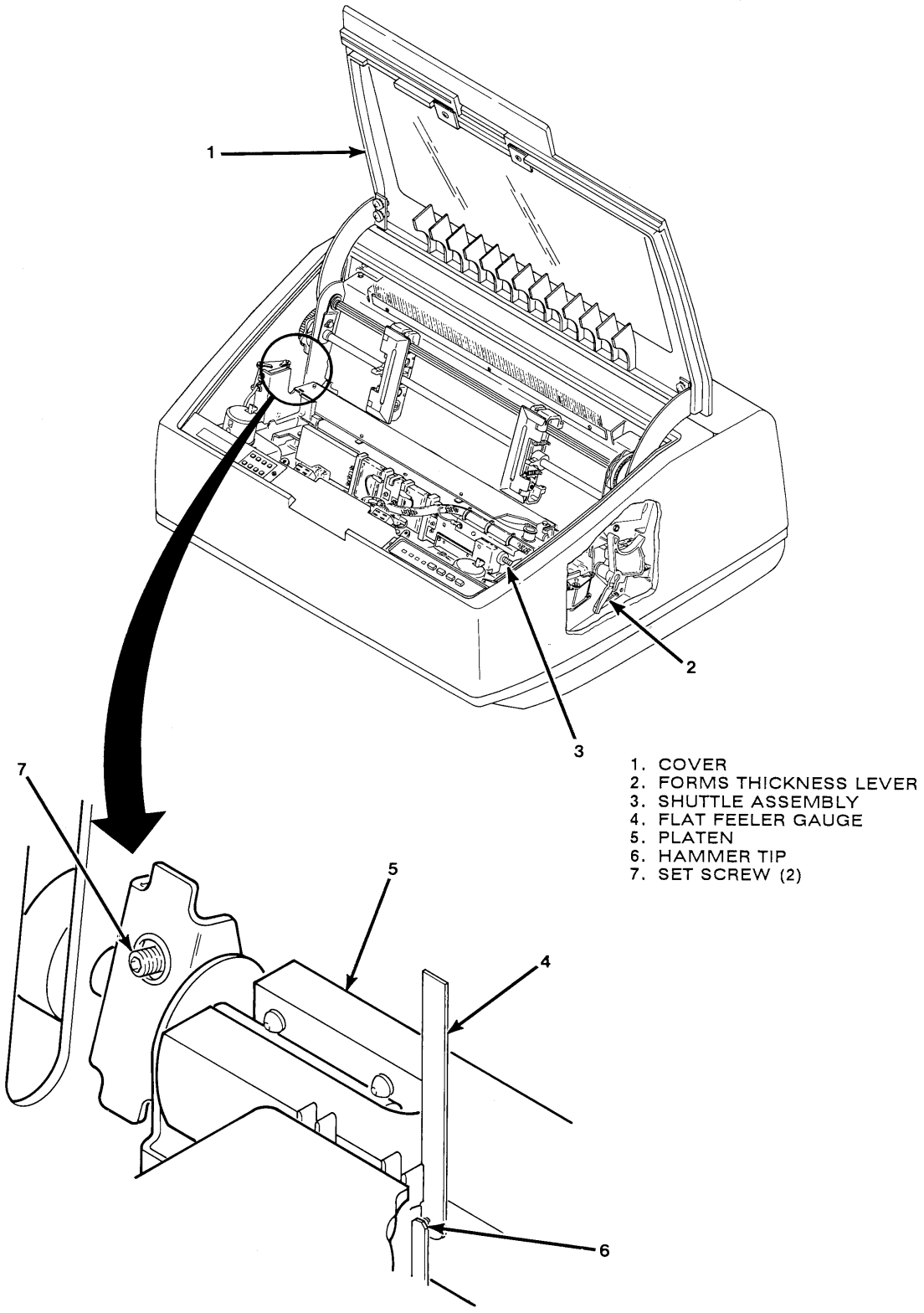
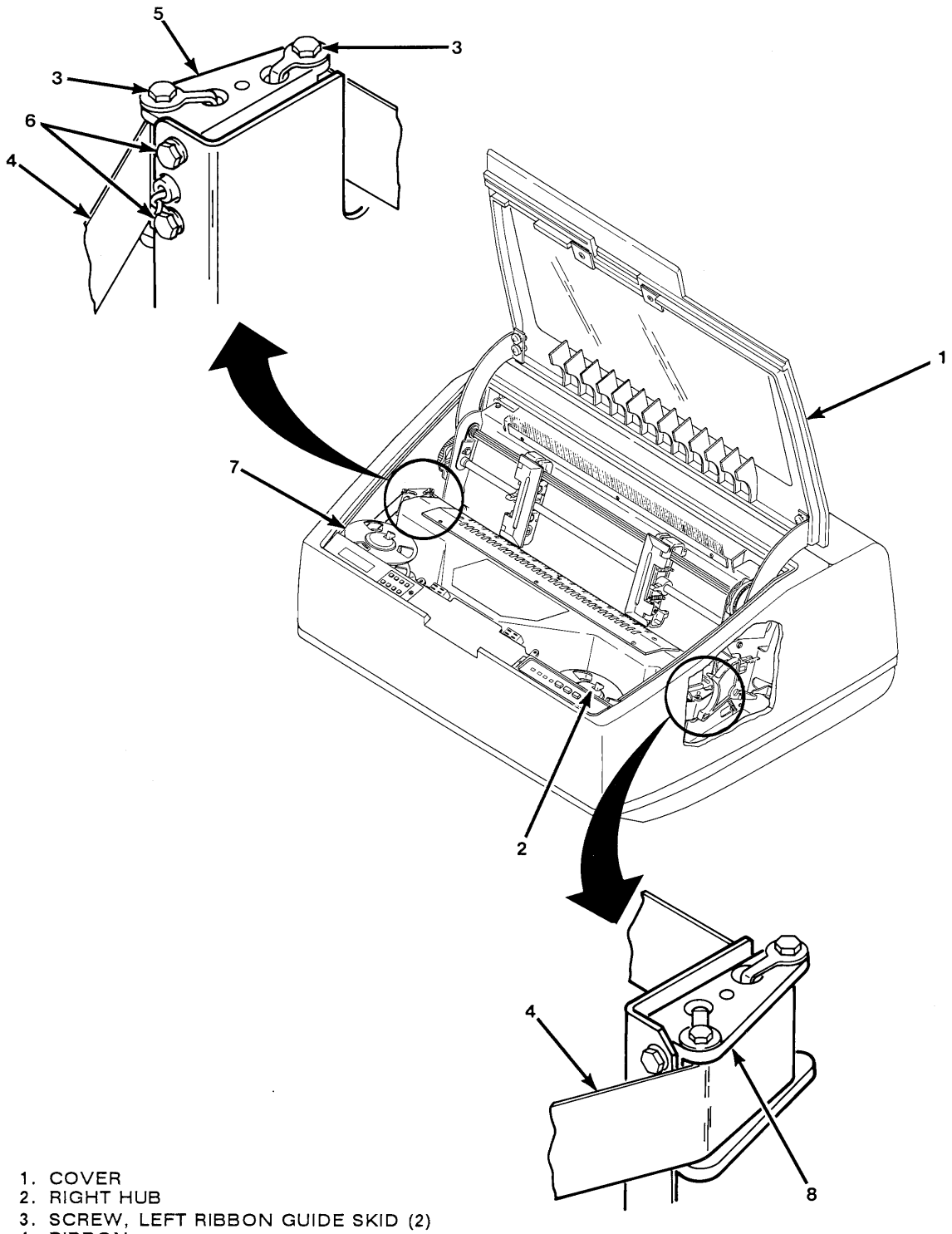


Figure 5−9. Platen Gap Adjustment

5−14. Ribbon Guide Alignment (Figure 5−10)

1. Open cover (1).
2. Verify paper and ribbon are installed. Ribbon should have full spool on right hub (2).
3. Run a shuttle and ribbon test.
4. Momentarily short between left ribbon guide skid screws (3) to assure right to left motion of ribbon.
5. Observe how ribbon (4) is passing through left guide (5). It should be centered.
6. If ribbon is not centered, loosen retaining screws (6) just enough that guide (5) can be forced to new positions but otherwise remains in place.
7. Reposition guide (5) as necessary to center ribbon (4).
8. Observe how ribbon (4) is winding on left spool (7). Reposition guide (5) as necessary to allow ribbon to wind up without interference.
9. Tighten screws (6).
10. Allow most of ribbon to accumulate on left spool (7). Repeat 3 through 9 for right guide (8).



1. COVER
2. RIGHT HUB
3. SCREW, LEFT RIBBON GUIDE SKID (2)
4. RIBBON
5. RIBBON GUIDE, LEFT
6. SCREW, RETAINING (2)
7. LEFT SPOOL
8. RIBBON GUIDE, RIGHT

Figure 5−10. Ribbon Guide Alignment

Section III. REPLACEMENT

❑ WARNING ❑

Unless otherwise specified, all replacement procedures are to be performed with power disconnected from the printer. Failure to remove power could result in injury to personnel or damage to equipment.

5−15. Cabinet (Figure 5−11)

a. Removal

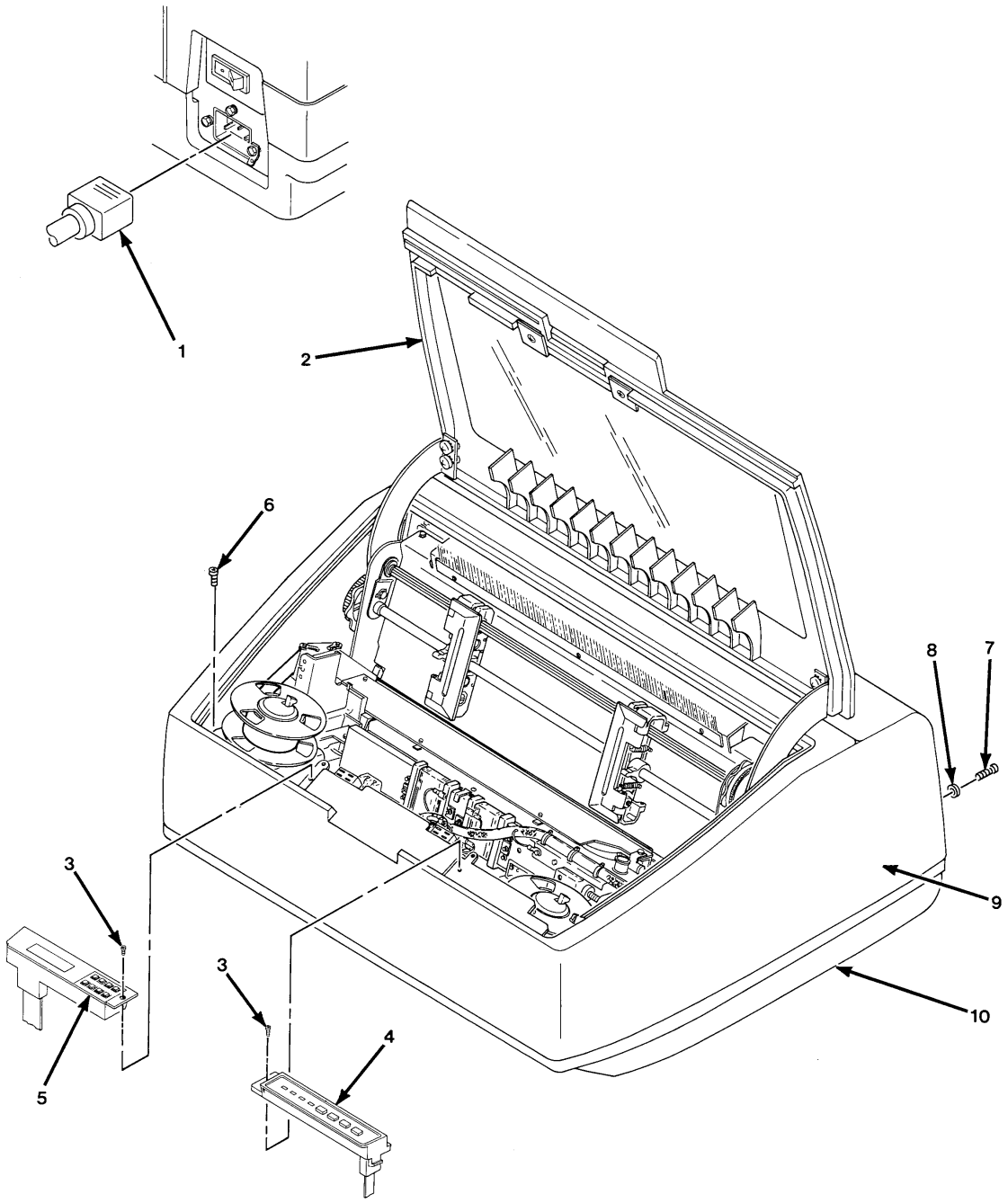
1. Disconnect power cord (1).
2. Open cover (2).
3. Loosen screws (3). Set control panel (4) and display control panel (5) inside cabinet.
4. Loosen two Phillips head screws (6).
5. Loosen two Phillips head screws (7) with finishing washers (8).
6. Close cover (2).
7. Lift cabinet (9) off base (10).

b. Installation

❑ CAUTION ❑

Take care during the following procedure to avoid pinching or creasing front panel ribbon cable.

1. Place cabinet (9) on base (10).
2. Tighten two Phillips head screws (7).
3. Tighten two phillips head screws (3).
4. Install control panel (4), display control panel (5) and tighten two screws (3).
5. Close cover (2).
6. Connect power cord (1).



1. POWER CORD
2. COVER
3. SCREW (2)
4. CONTROL PANEL
5. DISPLAY CONTROL PANEL
6. SCREW, PHILLIPS (2)
7. SCREW PHILLIPS (2)
8. WASHER, FINISHING (2)
9. CABINET
10. BASE

Figure 5−11. Cabinet Removal/Installation

5−16. Control Panel (Figure 5−12)

a. Removal

1. Disconnect power cord (1) and open cover (2).
2. Loosen screw (3).
3. Separate control panel (4) from cabinet (5).
4. Disconnect P31 (6) inside right side of printer.

b. Installation

1. Connect P31 (6).
2. Place control panel (4) in cabinet (5).
3. Tighten screw (3).
4. Close cover (2). Connect power cord (1). Check operation per Operator's Guide.

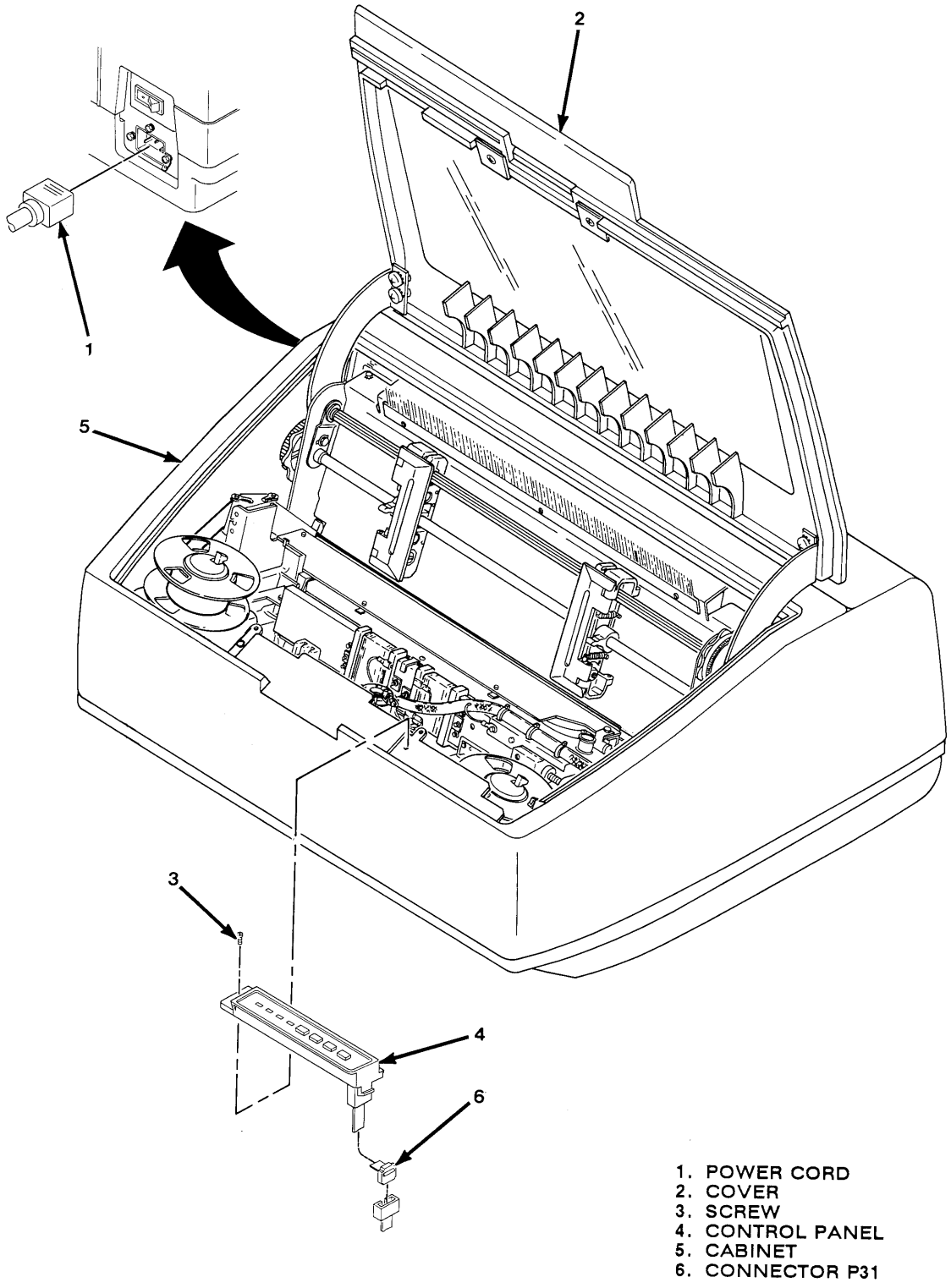


Figure 5−12. Control Panel Removal/Installation

5−17. Cover (Figure 5−13)

a. Removal

1. Disconnect power cord (1) and open cover (2).
2. Remove four Phillips head screws (3) and lockwashers (4).
3. Separate cover (2) from hinges (5).

b. Installation

1. Position cover (2) on hinges (5).
2. Install four Phillips head screws (3) and lockwashers (4).
3. Close cover (2) to check alignment. If misaligned, loosen four screws (3), reposition cover (2), and tighten screws.
4. Connect power cord (1).

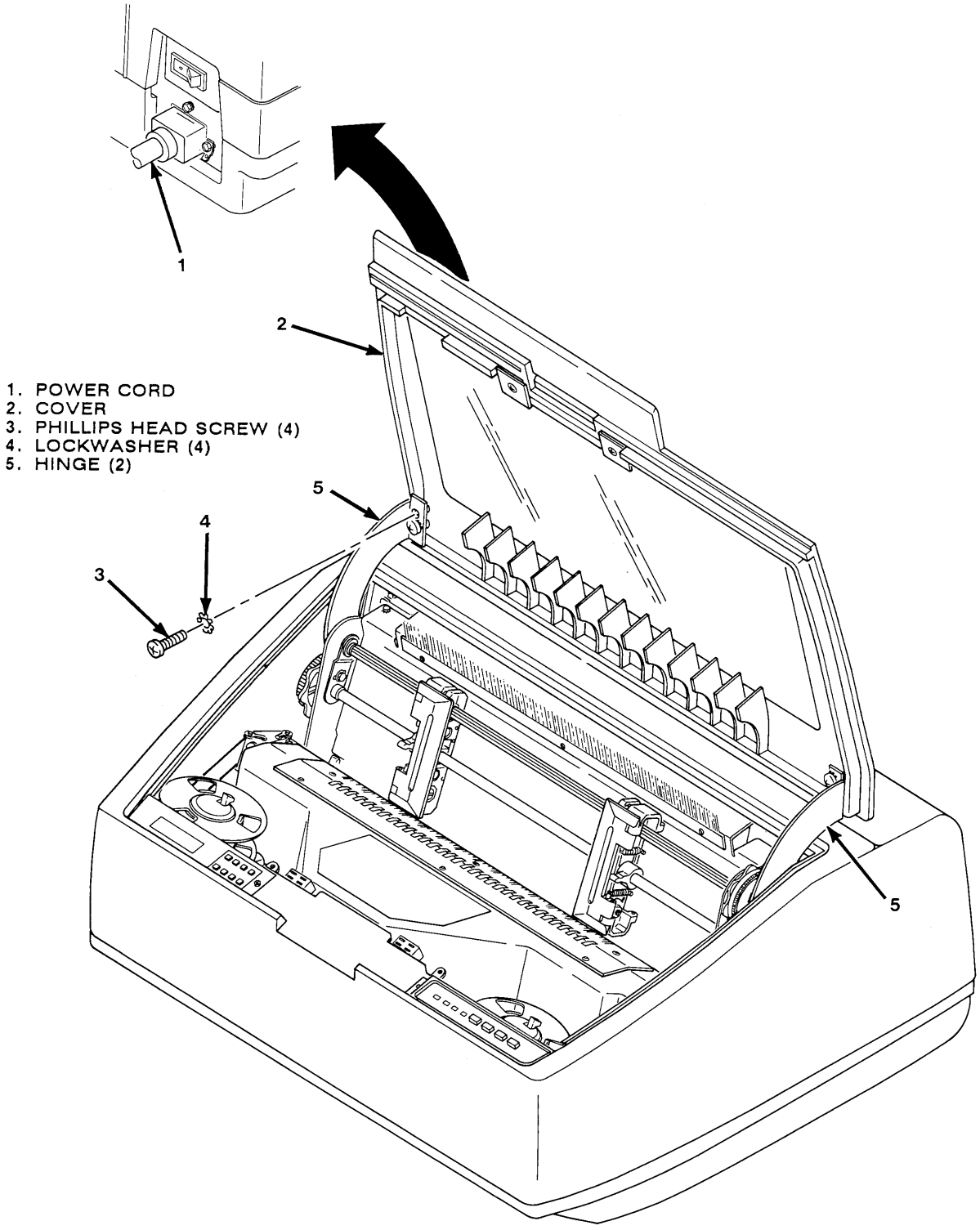


Figure 5−13. Cover Removal/Installation

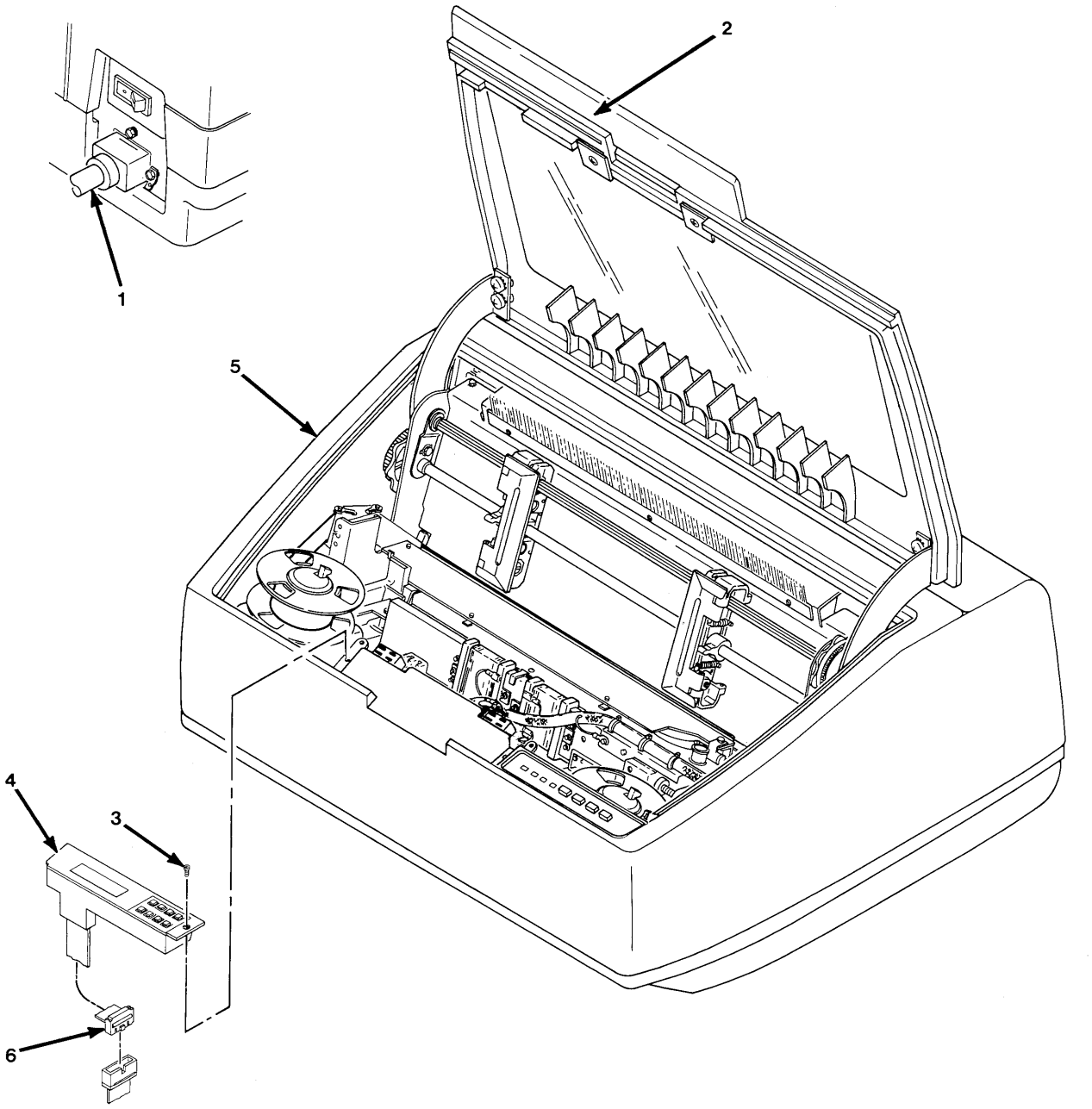
5−18. Display Control Panel (Figure 5−14)

a. Removal

1. Disconnect power cord (1). Open cover (2).
2. Loosen screw (3).
3. Separate display control panel (4) from cabinet (5).
4. Disconnect connector P1 (6).

b. Installation

1. Connect connector P1 (6).
2. Place display control panel (4) on cabinet (5).
3. Tighten screw (3).
4. Close cover (2). Connect power cord (1). Check operation.



1. POWER CORD
2. COVER
3. SCREW
4. DISPLAY CONTROL PANEL
5. CABINET
6. CONNECTOR P1

Figure 5−14. Display Control Panel Removal/Installation

5−19. Control Panel Cable (Figure 5−15)

a. Removal

1. Remove cabinet per paragraph 5−15a.
2. Disconnect connector P1 (1) from display control panel (2) and P31 (3) from control panel (4).
3. Remove all plug in PCBAs per paragraphs 5−20a, 21a, and 22a.
4. Remove two hex head screws (5) and washers (6) That secure connector J3 (7).
5. Remove ten screws (8) that secure motherboard PCBA (9).
6. Lift motherboard PCBA (9) and insulator (10) and remove cable (11) that passes under it.

b. Installation

1. Place cable (11) under motherboard PCBA (9) so that connector J3 (7) is in position on base (12).
2. Install two hex screws (5) and washers (6). Do not tighten fully.
3. Position insulator (10) and motherboard PCBA (9) on base (12).
4. Install ten screws (8).
5. Route cable (8) to front of printer and connect connector P1 (1) to display control panel (2) and P31 (3) to control panel (4).
6. Install controller PCBA (refer to para 5−20) to align J3 (7). Remove controller PCBA and tighten screws (5).
7. Install all plug in PCBAs per paragraphs 5−20b, 21b, and 22b.
8. Install cabinet per paragraph 5−15b.

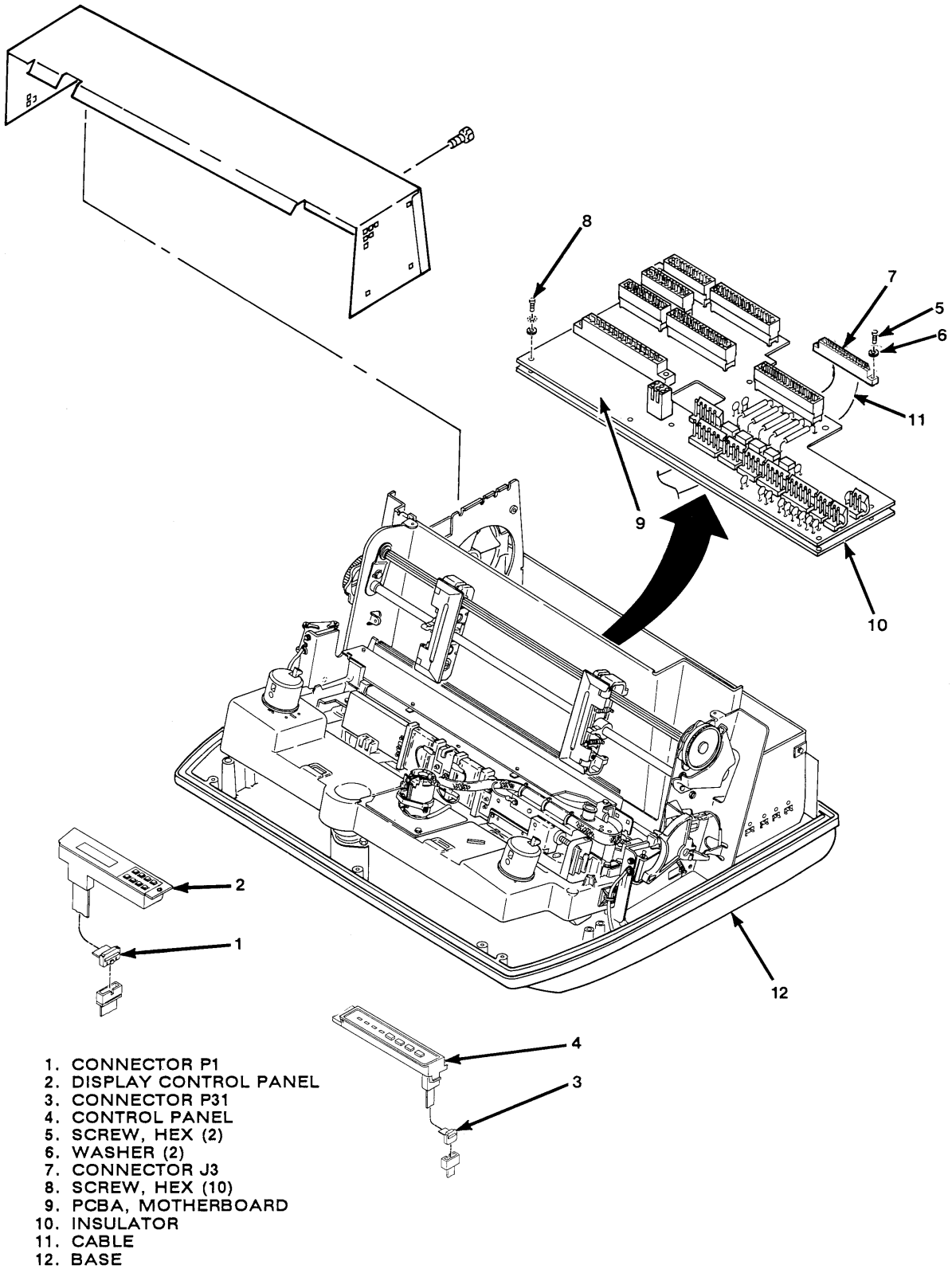


Figure 5−15. Control Panel Cable Removal/Installation

5−20. Controller PCBA (Figure 5−16)

a. Removal

1. Disconnect I/O connector (1).
2. Remove cabinet per paragraph 5−15a.
3. Loosen three screws (2) and remove EMI shield cover (3).
4. Grasp controller (4) and pull up to unseat connectors at base.
5. Open latches (5) on connector P4 (6).
6. Disconnect connector J4 (7).
7. Separate controller (4) from base (8).

b. Installation

NOTE: When controller PCBA or DCU PROMs are replaced, check hammer phasing per paragraph 5−8 and adjust if necessary.

1. Install program PROMs (Figure 5−17, 1 and 2), font PROMs (3), host terminating resistors (4), and memory paging prom (5) on replacement PCBA. Use components from replaced board if appropriate.
2. Connect connector J4 (7).
3. On connector P4 (6) close latches (5).
4. Position controller (Figure 5−16, 4) in base (8).
5. Install EMI shield cover (3) and tighten three screws (2).
6. Install cabinet per paragraph 5−15b.
7. Connect I/O cable (1).
8. Apply power and run configuration test pattern to verify operation.

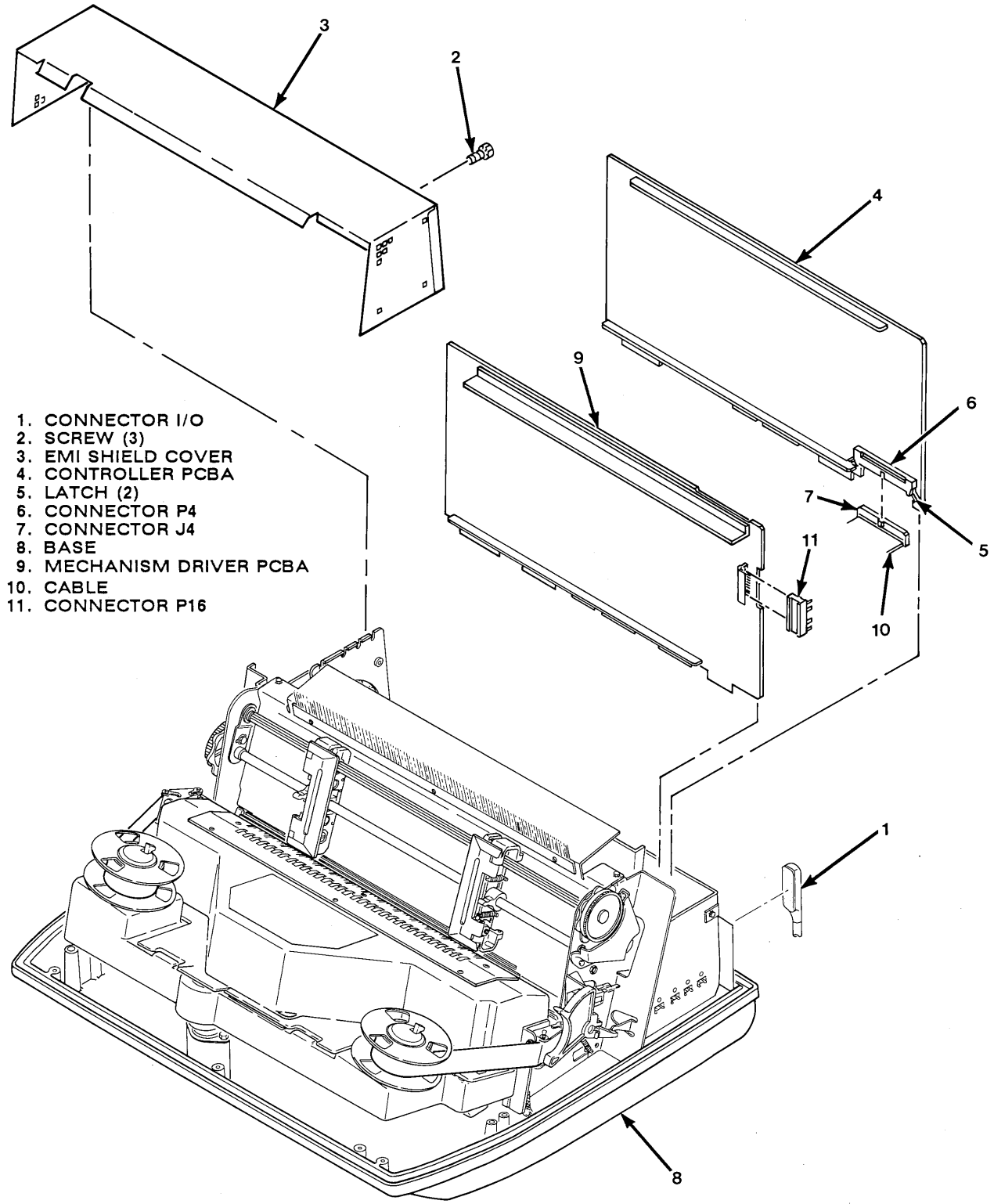


Figure 5−16. Controller and Mechanism Driver Removal/Installation

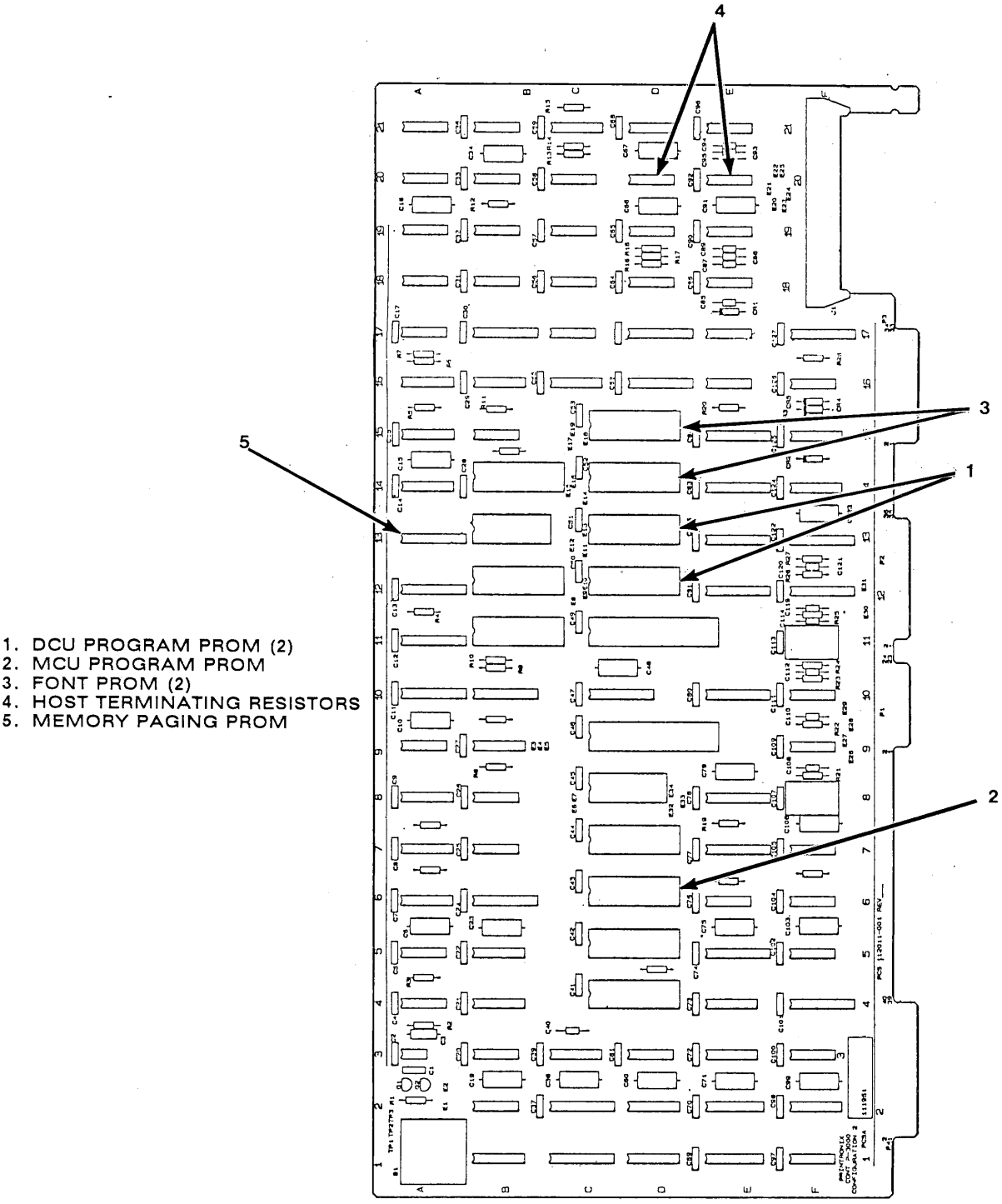


Figure 5−17. Controller PROM Locations

5−21. Mechanism Driver PCBA (Figure 5−16)

a. Removal

1. Remove cabinet per paragraph 5−15a.
2. Loosen three screws (2) and remove EMI shield cover (3).
3. Disconnect connector P16 (11).

❑ **CAUTION** ❑

Do not use heat sink on mechanism driver top edge as a handle. Damage to board could result.

4. Grasp both sides of mechanism driver (9) and lift straight up.

b. Installation

1. Position mechanism driver (9) in base (8). Make sure cable (10) is looped under board.
2. Push down driver (9) to seat connectors.
3. Connect connector P16 (11).
4. Install EMI shield cover (3) and tighten three screws (2).
5. Install cabinet per paragraph 5−15b.

5−22. Power Supply PCBA (Figure 5−18)

NOTE: Remove and install mech driver PCBA per paragraph 5−21 if necessary to gain access to power supply PCBA.

a. Removal

1. Remove cabinet per paragraph 5−15a.
2. Loosen three screws (1) and remove EMI shield cover (2).
3. Lift flap (3).
4. Disconnect connector J18 (4) from J1 (5).
5. Disconnect connector J19 (6) from J2 (7).

❑ CAUTION ❑

Do not grasp components on power supply PCBA during removal/installation. Damage to soldered connections may result.

6. Grasp power supply PCBA (8) with both hands and pull straight up away from base (9).

b. Installation

1. Place power supply PCBA (8) into position in base (9) and press down to seat connector.
2. Connect connector J19 (6) to J2 (7).
3. Connect connector J18 (4) to J1 (5).
4. Fold down flap (3).
5. Install EMI shield cover (2) and tighten three screws (1).
6. Install cabinet per paragraph 5−15b.

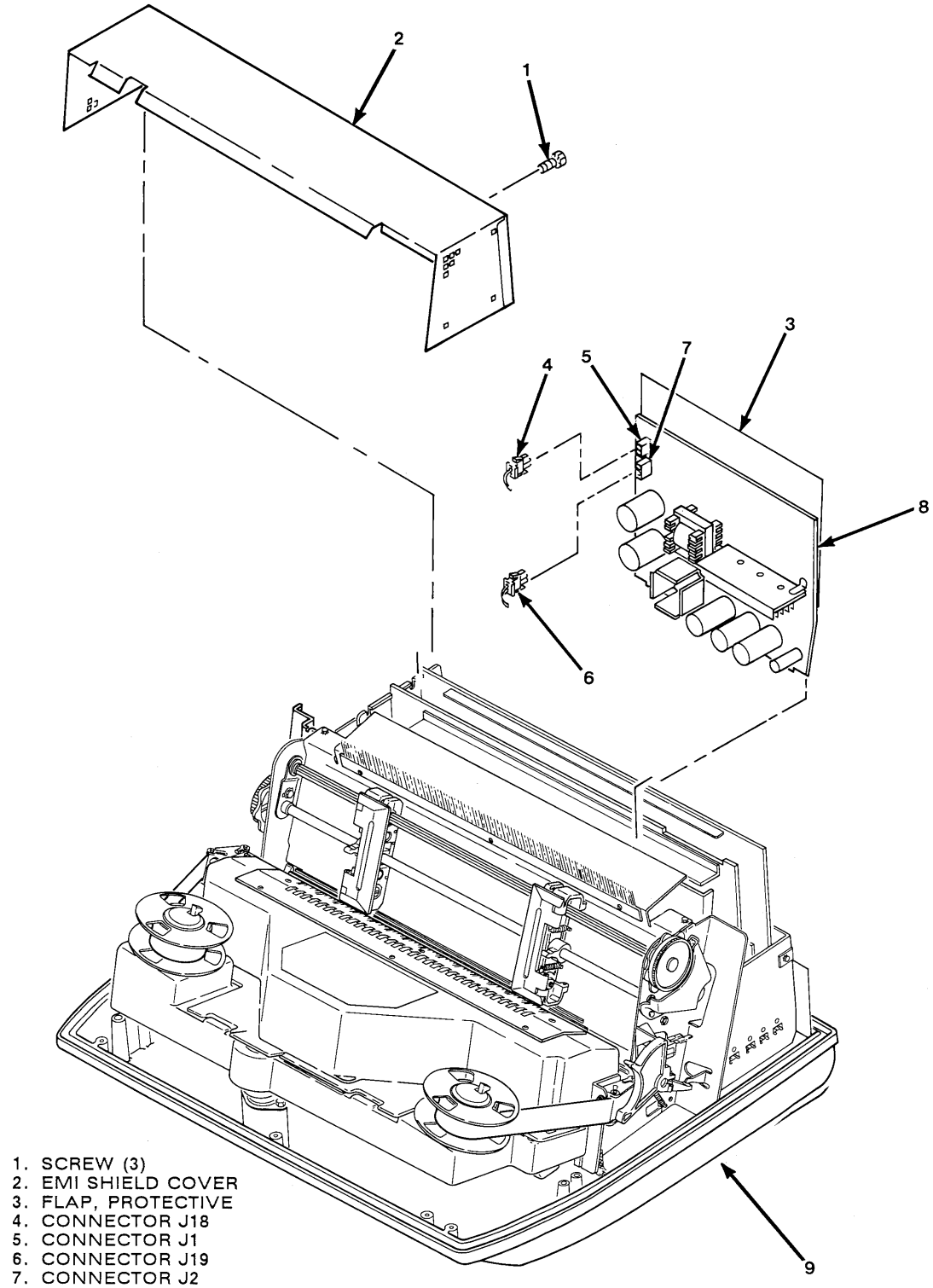


Figure 5−18. Power Supply PCBA Removal/Installation

5−23. Shuttle Cover (Figure 5−19)

a. Removal

1. Open cover (1). Set forms thickness lever (2) fully open.
2. Squeeze latches (3) and remove ribbon spools (4) from hubs (5).
3. Lift ribbon and spools out of printer.
4. Loosen two screws (6). Grasp edges of shuttle cover (7) and lift out. Side of cover farthest from you will come free first.

b. Shuttle Cover Installation

1. Place cover (7) in printer. Tilt back of cover (8) down slightly and engage tabs (8) in slots (9) at front of printer.
2. Line up slots (10) at sides of cover (7) with tabs (11) in printer. Push down firmly on rear of cover (7). Tighten two screws (6).
3. Install ribbon spools (4) on hubs (5) and route ribbon properly.
4. Set forms thickness lever (2) closed. Close cover (1).

1. COVER
2. FORMS THICKNESS LEVER
3. SPOOL LATCH (2)
4. SPOOL (2)
5. SPOOL HUB (2)
6. SCREW (2)
7. SHUTTLE COVER
8. TABS, REAR (2)
9. SLOTS, FRONT (2)
10. SLOTS, SIDE (2)
11. TABS, SIDE (2)
12. SCREW, BUTTON HEAD (6)
13. LOCKNUT (6)
14. PAPER SCALE

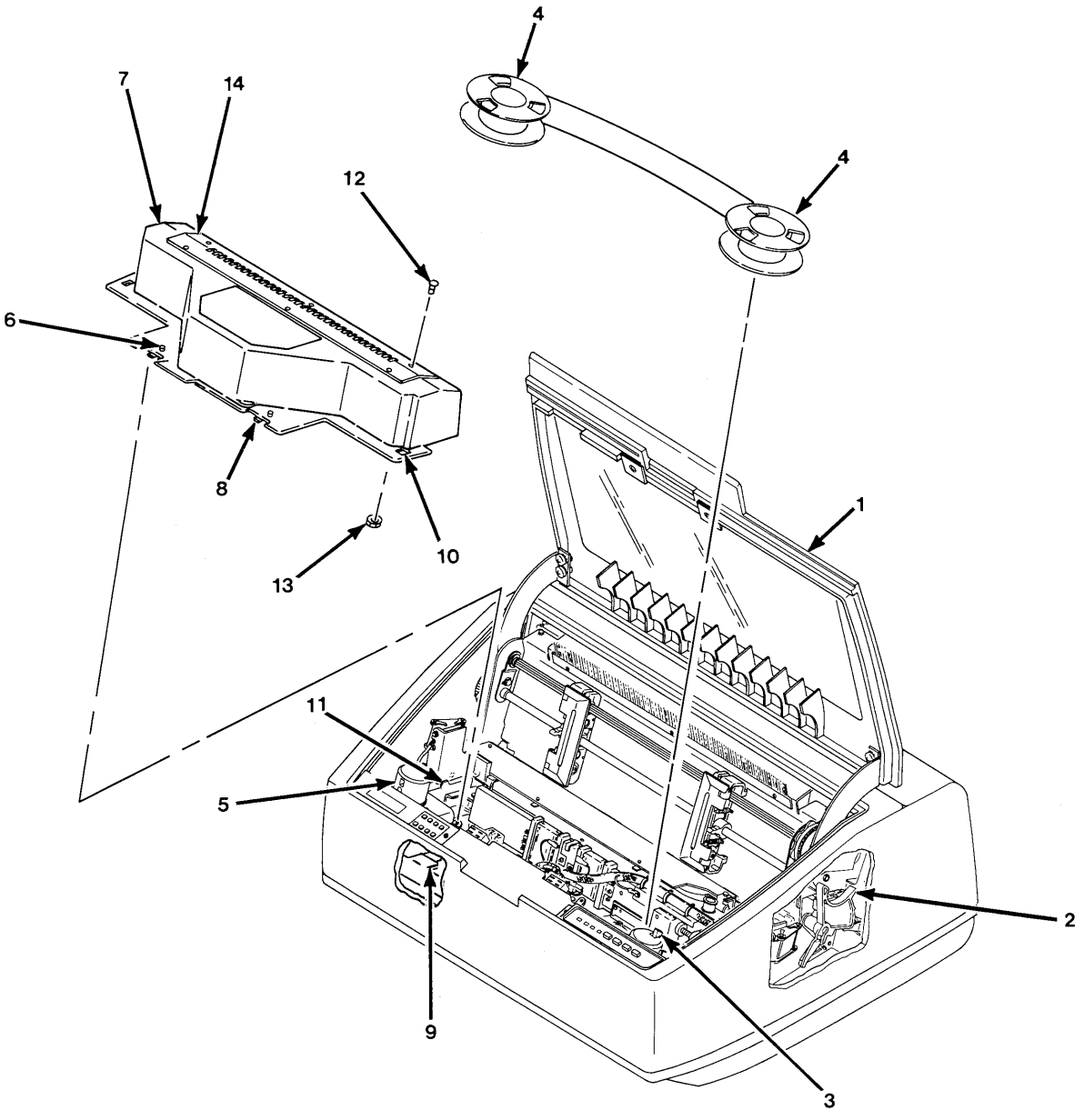


Figure 5−19. Shuttle Cover and Paper Scale Removal/Installation

5−24. Paper Scale (Figure 5−19)

a. Removal

1. Remove shuttle cover per paragraph 5−23a.
2. Remove six button head screws (12) and locknuts (13).
3. Separate paper scale (14) from shuttle cover (7).

b. Installation

1. Place paper scale (14) on shuttle cover (7).
2. Install six button head screws (12) and locknuts (13).
3. Install shuttle cover per paragraph 5−23b.
4. Adjust paper scale if required per paragraph 5−3.

5−25. Motherboard PCBA (Figure 5−20)

a. Removal

1. Remove controller, mechanism driver, and power supply PCBAs per paragraphs 5−20a, 21a, and 22a.
2. Disconnect all connectors (1) from motherboard PCBA (2).
3. Remove ten screws (3) and washers (4).
4. Separate motherboard PCBA (2) and insulator (5) from base (6).

b. Installation

1. Place motherboard board (2) and insulator (5) in base (6).
2. Install ten screws (3) and washers (4).
3. Connect nine connectors (1) to motherboard PCBA (2).
4. Install controller, mechanism driver, and power supply PCBAs per paragraphs 5−20b, 21b, and 22b.

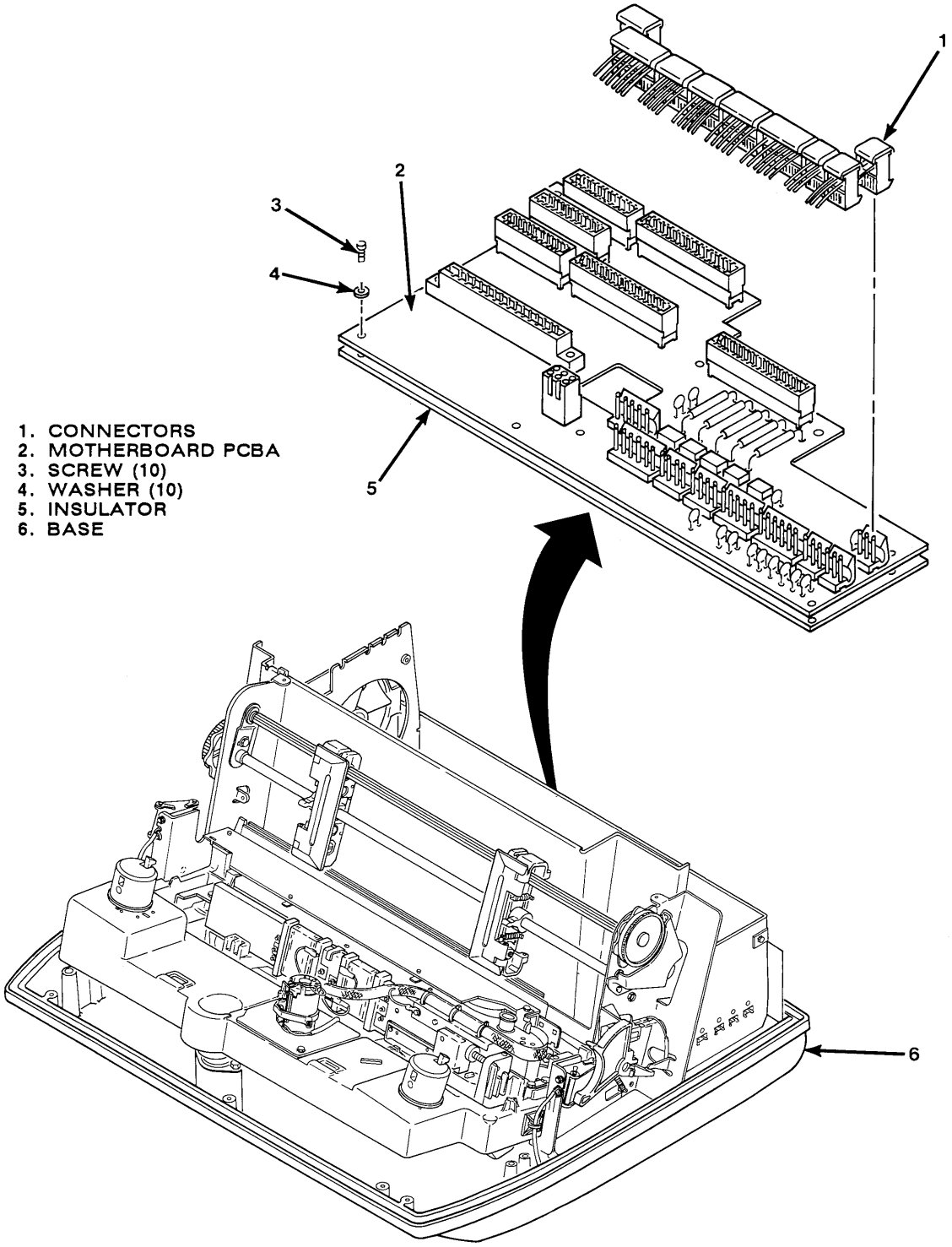


Figure 5−20. Motherboard PCBA Removal/Installation

5−26. I/O Cable Assembly (Figure 5−21)

a. Removal

1. Remove controller PCBA per paragraph 5−20a.
2. Remove two screws (1) and mounting plate (2).
3. Remove I/O cable (3) and attached mounting plate (2) from printer.

b. Installation

1. Place I/O cable (3) and attached mounting plate (2) in printer.
2. Install mounting plate (2) and two screws (1).
3. Install controller PCBA per paragraph 5−20b.

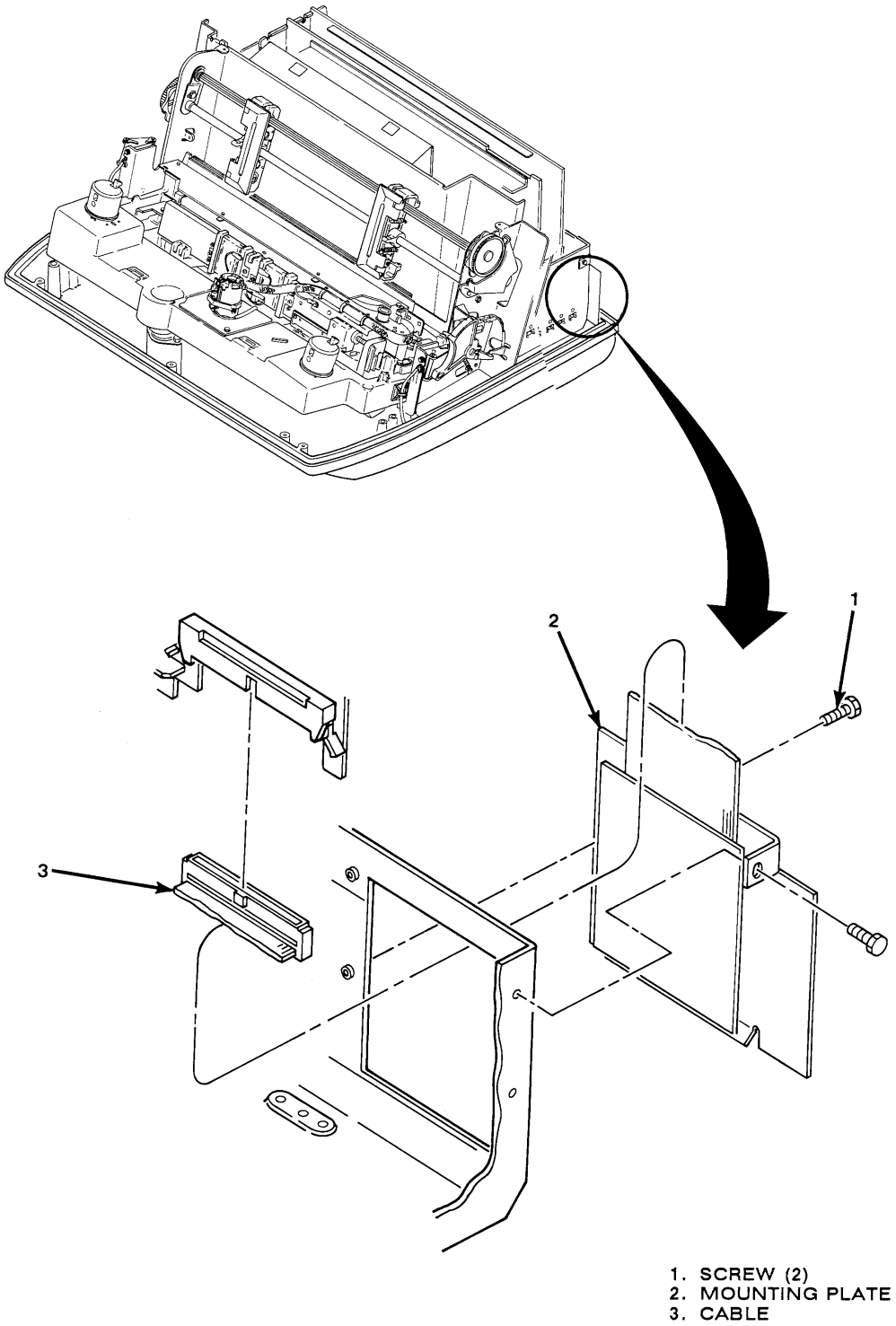


Figure 5−21. I/O Cable Removal/Installation

5−27. Shuttle Assembly (Figure 5−22)

a. Removal

1. Remove controller, mechanism driver, and power supply PCBAs per paragraphs 5−20a, 21a, and 22a.

   NOTE: Cut cable ties as necessary to free cables during removal.

2. Loosen two screws (1). Remove shuttle cover (2).
3. Disconnect connector P21 (3) from motherboard PCBA (4).
4. Remove four screws (5) and washers (6). Separate connector J11 (7) and J12 (8) from base (9).
5. Feed connectors P21 (3) and J11 (7) around to left side of base (9).
6. Remove screw (10). Separate cable anchor bracket (11) from base casting (23).
7. Remove three springs (12, 13, and 14) using tool 995822−001.
8. Remove two screws (15). Remove right pivot retainer (16).
9. Remove four screws (17) and casting brace (18).
10. Lift shuttle (19) out of printer while feeding connectors P21 (3) and J11 (7) and J12 (8) out through holes in base casting (23).

    NOTE: Be careful that wear saddles at end of axles are not inadvertently dropped and lost during removal/installation of shuttle.

b. Installation

1. Feed connectors P21 (3), J11 (7) and J12 (8) through holes in base casting (23) and position shuttle (19) in printer. Verify wear saddles (20) are in place.
2. Install casting brace (18) and four screws (17).
3. Remove shuttle end play.
   (a) Loosen two cap screws (21).
   (b) Insert 0.005 inch flat feeler gauge between right end of shuttle shaft (22) and base casting (23)
   (c) Push shuttle assembly (19) to left while pushing right end of shaft (22) against feeler gauge and base casting (23).
   (d) Tighten two cap screws (21). Remove feeler gauge.
4. Install right pivot retainer (16) and two screws (15).
5. Install three springs (12, 13, and 14) using tool 995822−001.
6. Place cable anchor bracket (11) on base casting (23). Install screw (10).
7. Route connectors P21 (3), J11 (7), and J12 (8) to their respective locations in base (9).

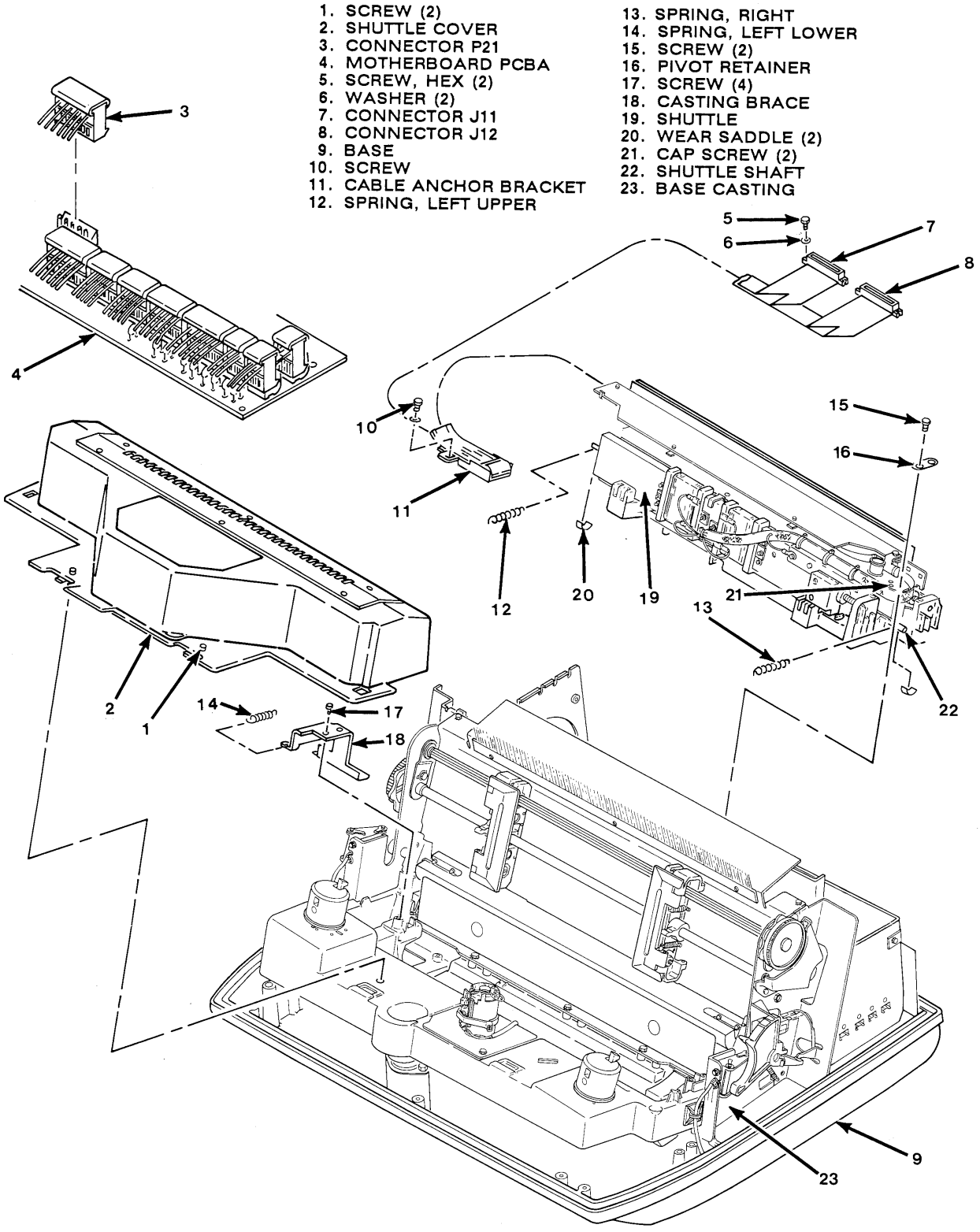


Figure 5−22. Shuttle Assembly Removal/Installation

5−27. Shuttle Assembly−Continued

b. Installation−Continued

8. Place connector J12 (7) in position on base (8). Install four screws (5) and washers (6).
9. Connect connector P21 (3) to motherboard PCBA (4).
10. Check cable between shuttle (19) and anchor bracket (11). Make sure there are no sharp bends or creases. Verify service loop is continuous and does not contact base when shuttle oscillates. Reposition as necessary.
11. Check that shuttle assembly (19) rotates between normal and service positions and there is no slack in encoder cable underneath shuttle.
12. Install controller, mechanism driver, and power supply PCBAs per paragraphs 5−20b, 21b, and 22b.
13. Install shuttle cover (2). Tighten two screws (1).
14. Verify print quality by printing repeating test patterns. If print is not acceptable, perform hammer alignment per paragraph 5−4, bumper adjustment per paragraph 5−6, or phasing adjustment per paragraph 5−8.

5−28. Hammer Bank Cable Assembly (Figure 5−23)

a. Removal

1. Remove PCBAs, shuttle cover, connectors, and cable anchor bracket per paragraph 5−27a, l through 6.
2. Feed cable assembly (1) up through hole in base.
3. Remove screw (2) and terminal lug E1 (3).
4. Disconnect four slide on terminals E2 through E5 (4 through 7).
5. Remove three tie wraps (8) from linear motor guide (9).
6. Remove screw (10). Separate cable guide (11) from hammer bank PCBA (12).
7. Remove three hex screws (13). Separate hammer bank PCBA (12) and attached cable from hammer bank (14). Note that connectors at bottom rear must be slid away from hammers to disconnect.

b. Installation

1. Place hammer bank PCBA (12) on hammer bank (14). Engage connectors at bottom rear of PCBA with pins on hammer coils. Install three hex screws (13).
2. Place cable guide (11) on hammer bank PCBA (12). Install screw (10).
3. Attach cable to linear motor guide (9) using three tie wraps (8).

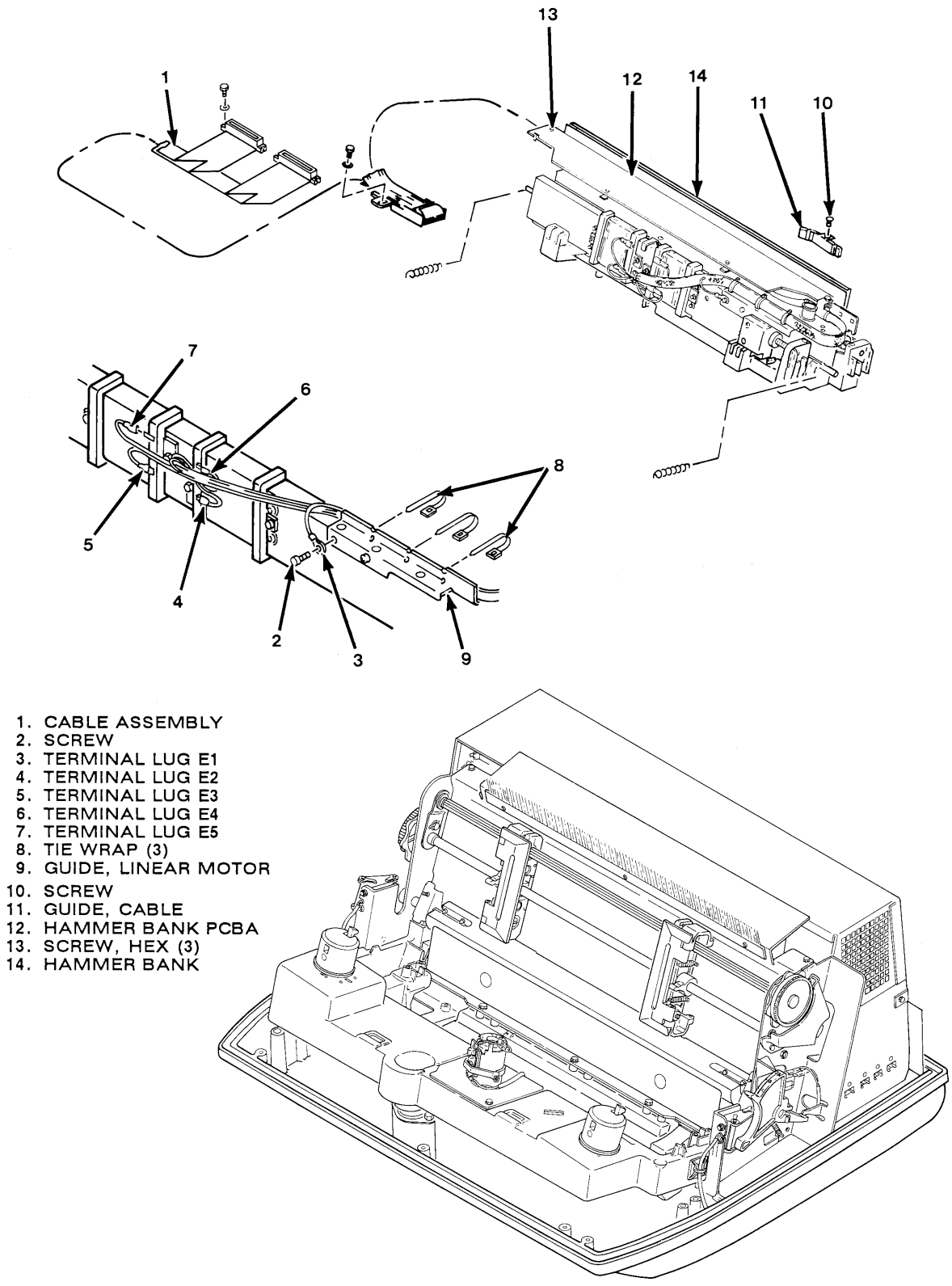


Figure 5−23. Hammer Bank Cable Assembly Removal/Installation

5−28. Hammer Bank Cable Assembly−continued

b. Installation−continued

4. Connect four slide on terminals E2 through E5 (4 through 7).
5. Install terminal lug (3) and screw (2).
6. Feed cable assembly (1) through hole in base.
7. Install cable anchor bracket, connectors, shuttle cover and PCBAs per paragraph 5−27b, steps 6 through 14.

5−29. Hammer Spring (Figure 5−24)

a. Removal

1. Open cover (1). Loosen two screws (2). Grasp shuttle cover (3) at both ends. Lift upward to free front tabs, then remove.
2. Unlock tractors (4) and move outward to sides.
3. Lift up on shuttle lock knob (5) and pull toward front of printer.
4. When shuttle assembly (6) has rotated 90 degrees to service position, release knob (5).

❑ **CAUTION** ❑

Shuttle is magnetized. This may cause some difficulty in performing the next step. Be careful not to bend cover.

5. Carefully lift ends of hammer bank cover (7) from roll pins (8). Pivot cover (7) onto its rear edge to about 45 degrees then remove.
6. Remove socket head screw (9) that secures hammer (10). Loosen other screw (11) on same clamp plate (12).
7. Remove hammer (10) by sliding it forward over hammer coil pole pin (13).

b. Installation

1. Place hammer (10) under clamp plate (12).
2. Install socket head screw (9). Do not tighten.
3. Align hammer and complete installation per paragraph 5−4.

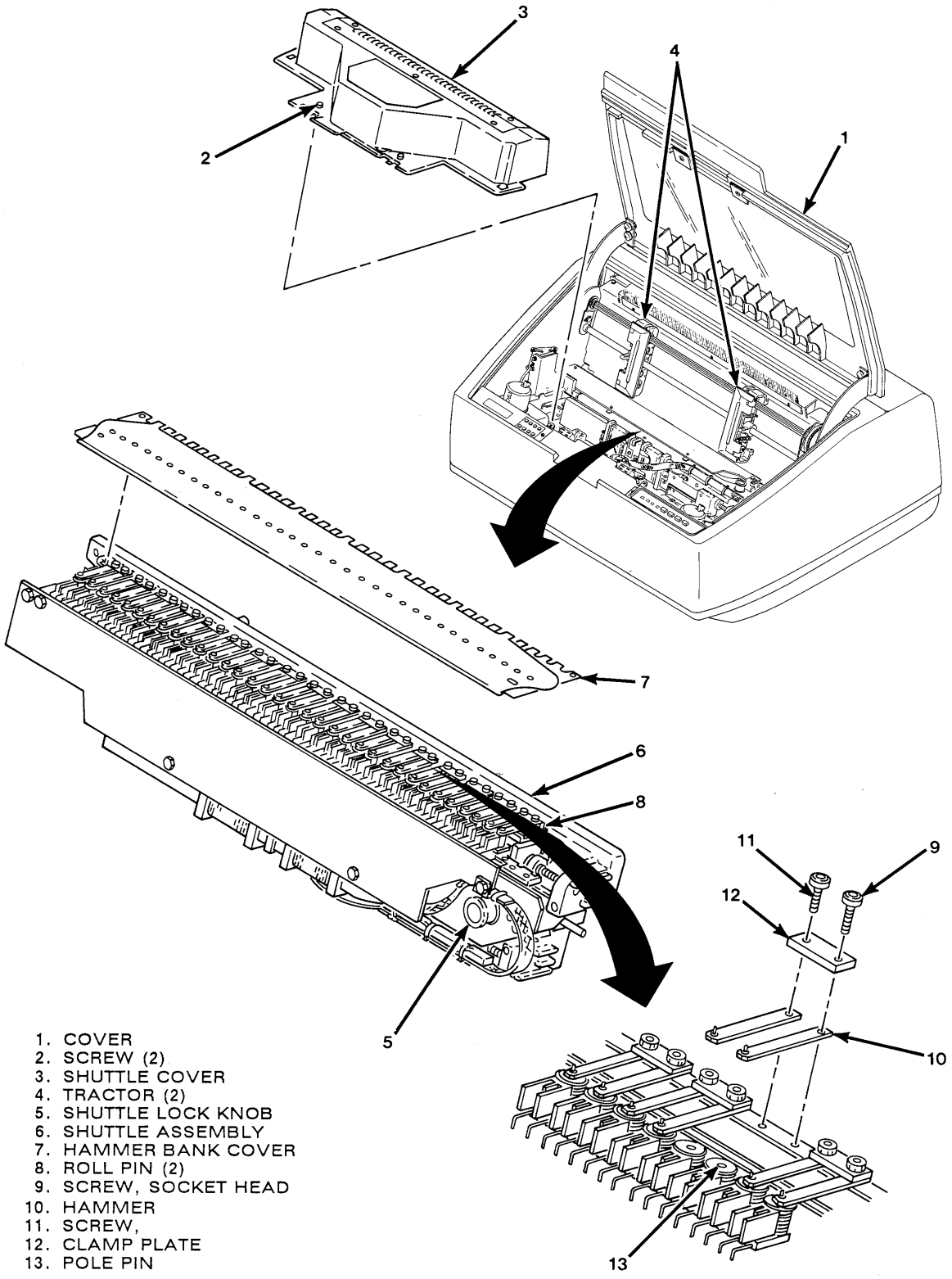


Figure 5−24. Hammer Spring Removal/Installation

5−30. Hammer Coil (Figure 5−25)

a. Removal

1. Remove hammer per paragraph 5−29a.

❑ CAUTION ❑

Be careful not to damage pole pin when removing hammer coil.

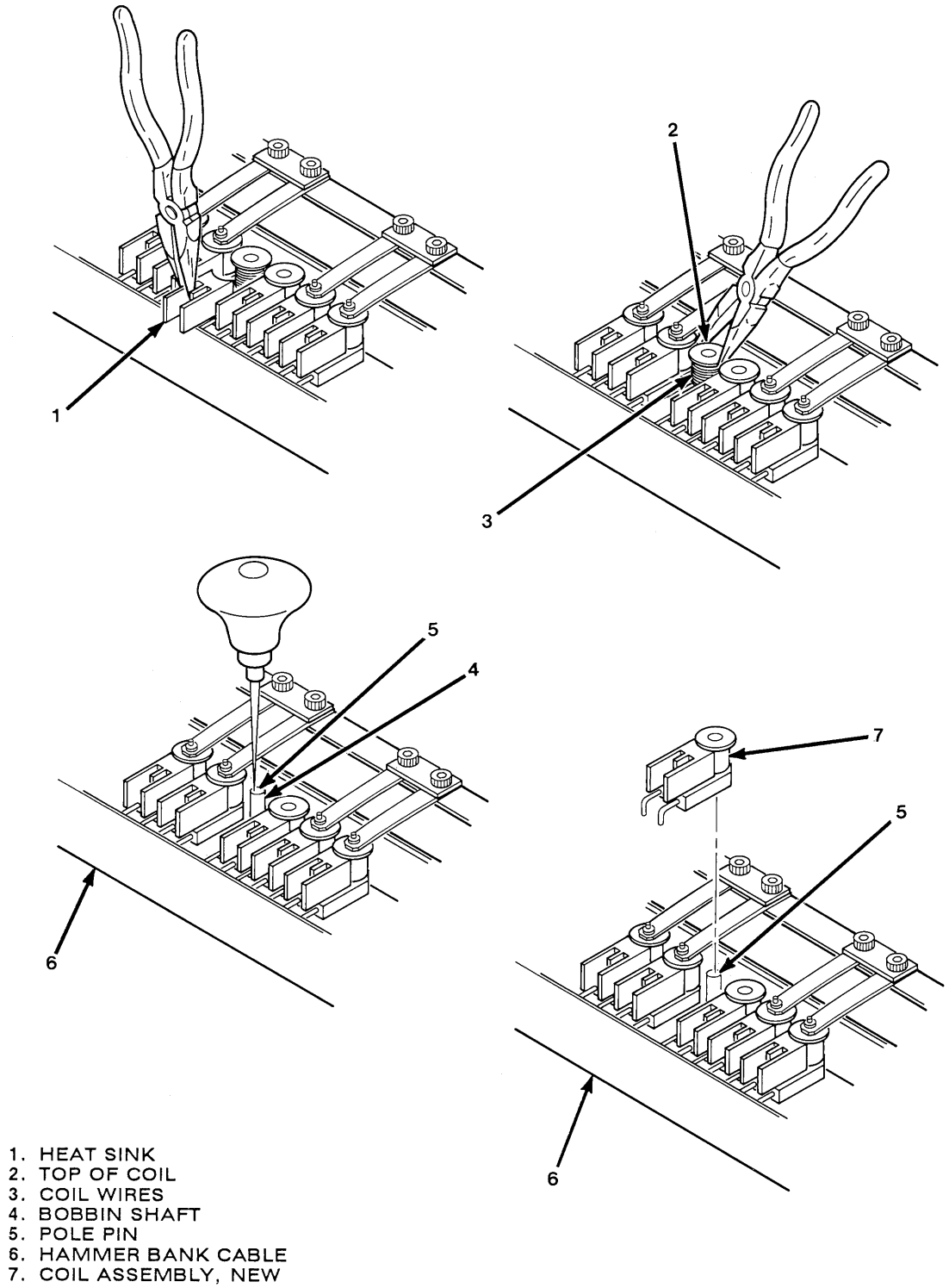
2. Break off coil heat sink (1).
3. Strip off top of coil (2) and wires (3).
4. Split bobbin shaft (4) and peel away from pole pin (5).
5. Clean pole pin (5) thoroughly.

b. Installation

❑ CAUTION ❑

Be careful when installing hammer coil. Damage to coil or pole pin is possible. Do not tap into place using hammer.

1. Press new hammer coil assembly (7) down firmly so base is below pole pin surface. Be sure to align and seat contact pins into hammer bank cable assembly (6).
2. Install hammer per paragraph 5−28b.



1. HEAT SINK
2. TOP OF COIL
3. COIL WIRES
4. BOBBIN SHAFT
5. POLE PIN
6. HAMMER BANK CABLE
7. COIL ASSEMBLY, NEW

Figure 5−25. Hammer Coil Removal/Installation

5−31. Encoder (Figure 5−26)

a. Removal

1. Open cover (1). Remove ribbon (2).
2. Loosen two captive screws (3). Grasp shuttle cover (4) at both ends. Lift upward and remove.
3. Remove two screws (5). Rotate shuttle (6) to service position.
4. Remove hammer bank cover (7).
5. Remove two screws (8). Move hammer bank assembly (9) aside to expose encoder cover (10).
6. Remove two socket head screws (11) using ball end Allen wrench.
7. Using needlenose pliers, remove encoder cover (10). Carefully lift out encoder (12) and spacer (13).

b. Installation

1. Position encoder (12) and spacer (13) on hammer bank mounting bar (14).
2. Place encoder cover (10) in position and install two socket head screws (11).
3. Place hammer bank assembly (9) on mounting bar (14). Install two screws (8).
4. Install hammer bank cover (7).
5. Rotate shuttle (6) to operating position. Install two screws (5).
6. Install shuttle cover (4). Tighten two screws (3).
7. Install ribbon (2). Close cover (1).
8. Check bumper timing per paragraph 5−6 and adjust if required.

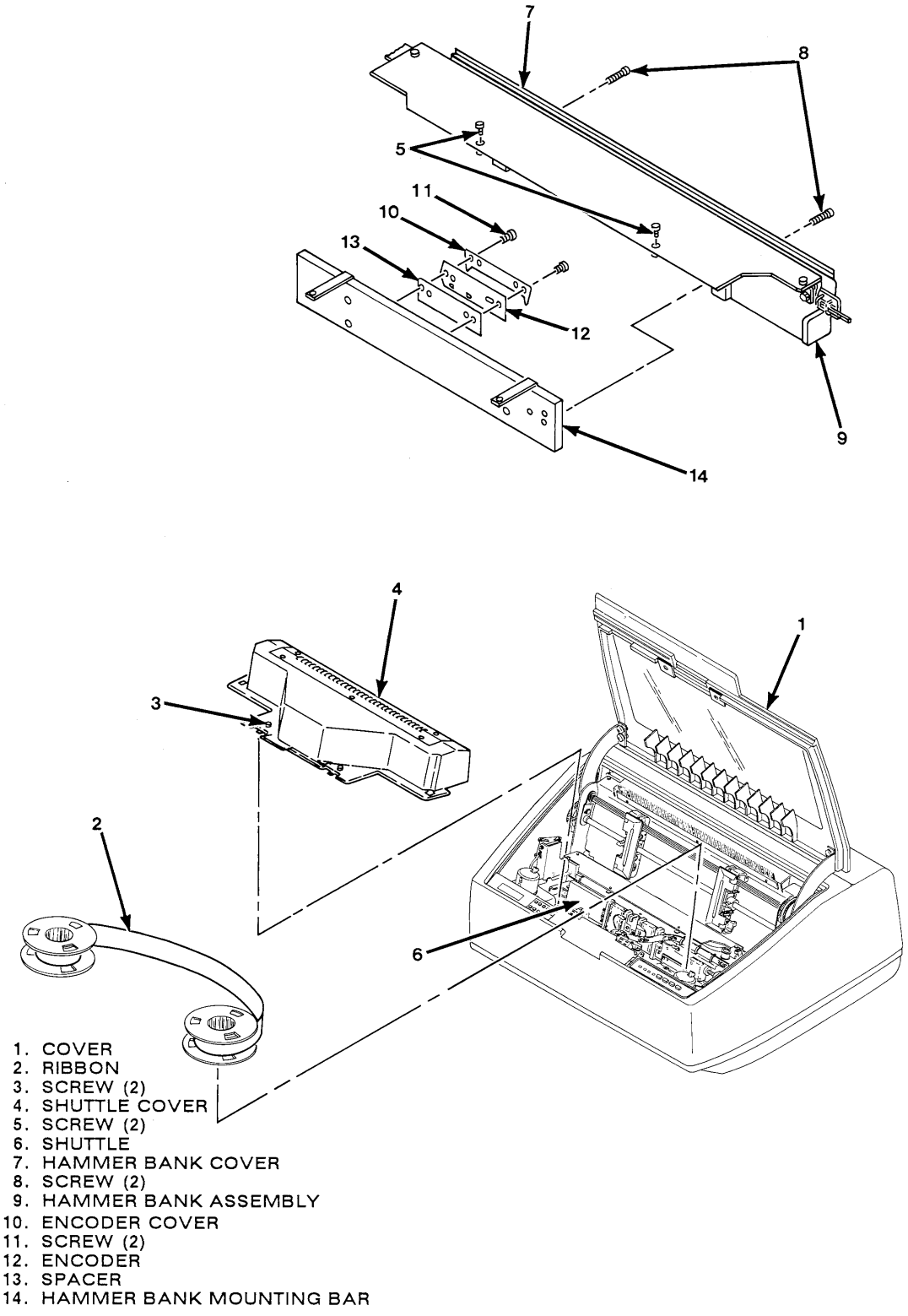


Figure 5−26. Encoder Removal/Installation

5−32. Encoder PCBA (Figure 5−27)

a. Removal

1. Remove controller, mechanism driver, and power supply PCBAs per paragraphs 5−20a, 21a, and 22a.
2. Disconnect connector P21 (1). Feed connector around to and up through hole in center of base (2). Cut ties as necessary to free cable.
3. Remove three springs (3, 4, and 5) using tool 995822−001.
4. Remove two screws (6) and pivot retainers (7).
5. Remove four screws (8) and casting brace (9).
6. Remove hex head screw (10) and washer (11).
7. Move aside cable anchor bracket (12).
8. Pick up shuttle assembly (13) and flip it over. Carefully rest it in base (2).
9. Remove two screws (14) from encoder bracket (15).
10. Remove screw (16) from optical sensor (17).
11. Remove two screws (18) from encoder PCBA (19).
12. Separate encoder PCBA (19) and its attached hardware from shuttle (13).

b. Installation

1. Position encoder PCBA (19) and optical switch (17) on shuttle (13).
2. Install two screws (18).
3. Install optical sensor (17) onto bracket (15) with screw (16).
4. Attach bracket (15) to shuttle (13) with screws (14).
5. Carefully pick up shuttle assembly (13) and turn it right side up in base (2).
6. Place cable anchor bracket (12) in position.
7. Install screw (10) and washers (11).
8. Install casting brace (9) and four screws (8).
9. Install pivot retainer (7) and two screws (6).
10. Install three springs (3, 4, and 5) using tool 995822−001.
11. Feed connector P21 (1) down through hole in center of base (2). Connect P21 (1). Retie as necessary.
12. Install controller, mechanism driver, and power supply PCBAs per paragraphs 5−20a, 21a, and 22a.

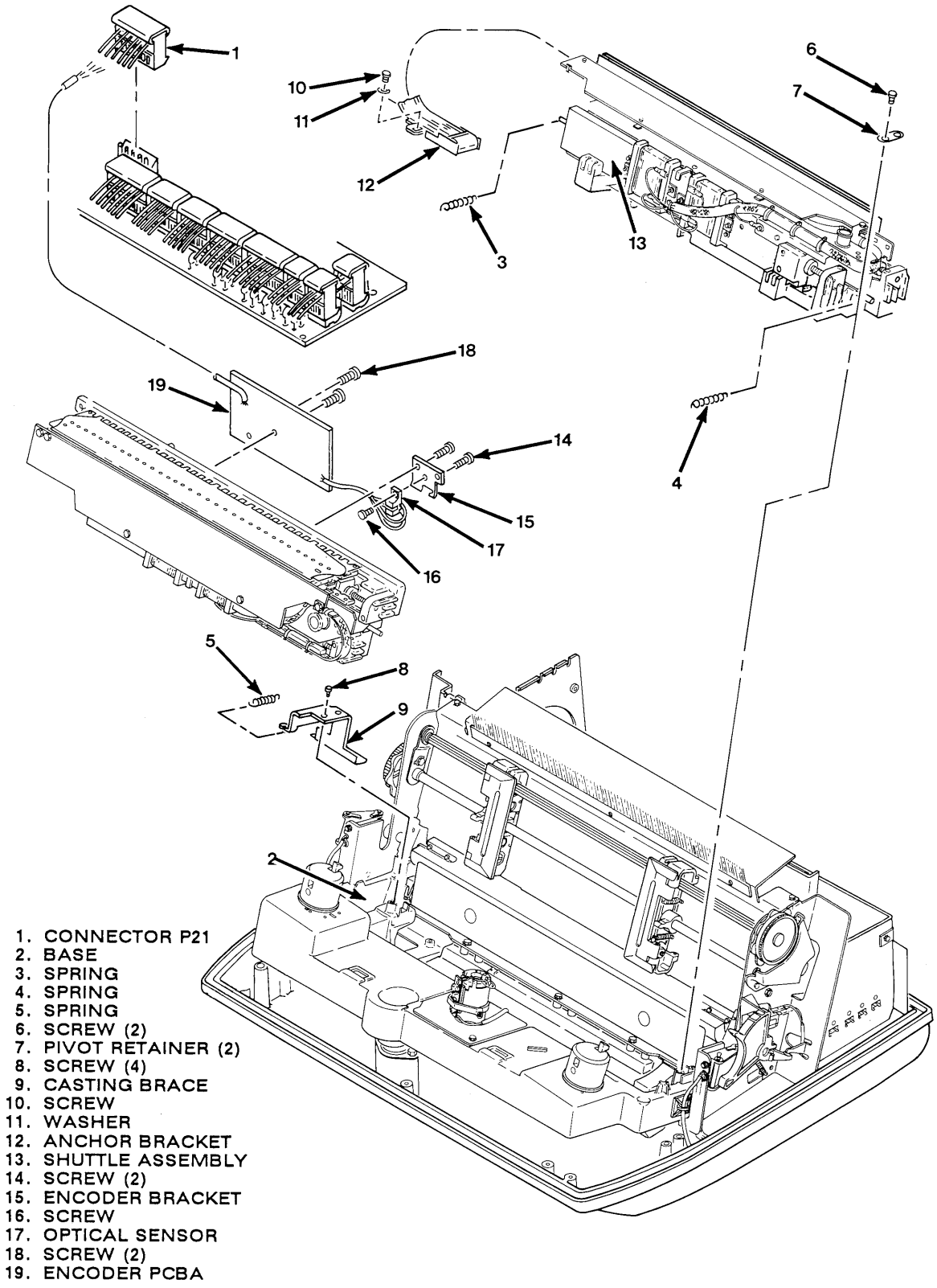


Figure 5−27. Encoder PCBA Removal/Installation

5−33. Bumper (Figure 5−28)

a. Removal

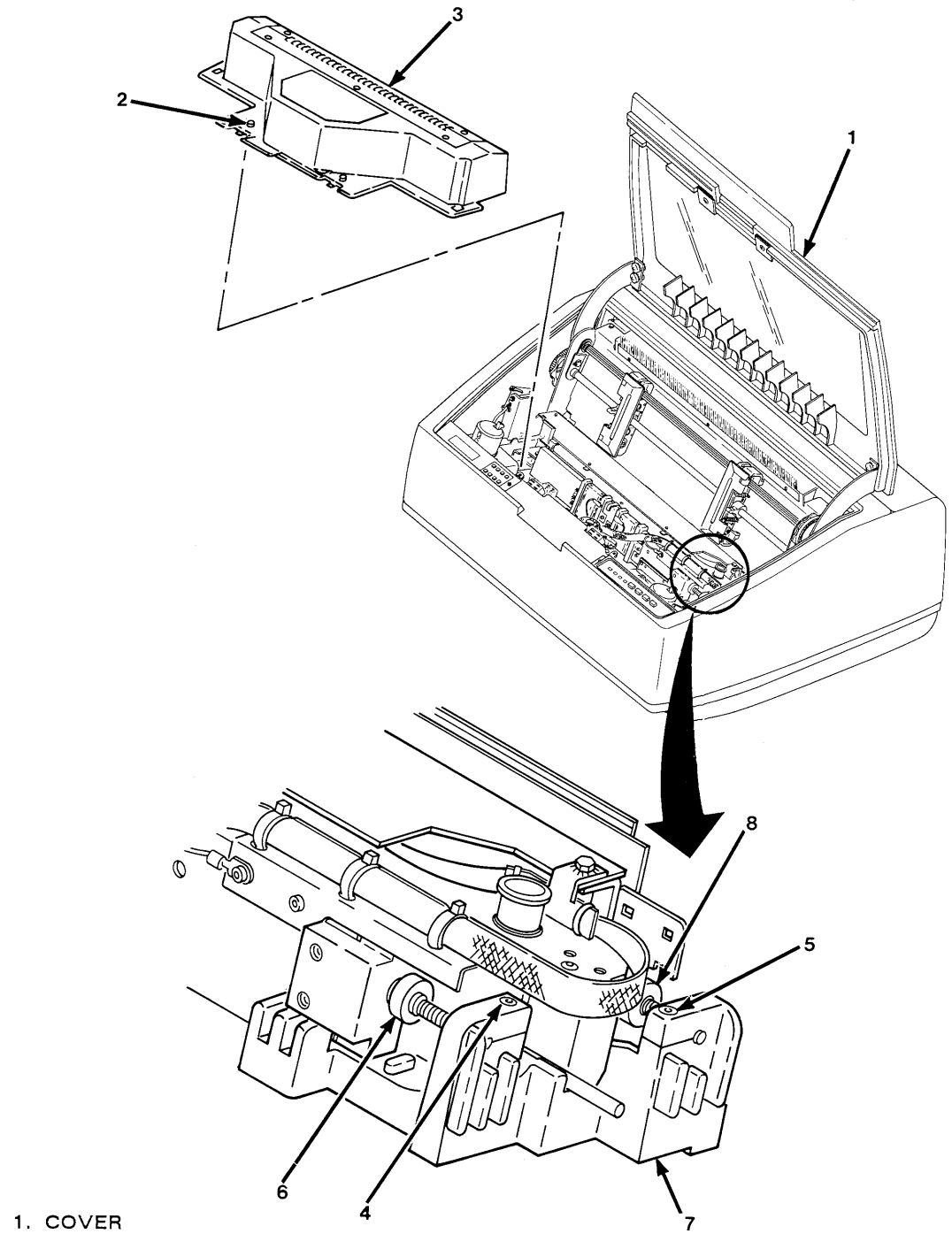
1. Open cover (1).
2. Loosen two screws (2). Grasp shuttle cover (3) at both ends. Lift upward to free tabs, then remove.
3. Loosen lockscrews (4 and 5).

   NOTE: It may be necessary to screw one bumper all the way in to remove the other one.

4. Unscrew front bumper (6) from base (7).
5. Unscrew rear bumper (8) from base (7).

b. Installation

1. Install rear bumper (8) in base (7).
2. Install front bumper (6) in base (7).
3. Perform bumper adjustment procedure per paragraph 5−6.
4. Tighten lockscrews (4 and 5) .
5. Install shuttle cover (3). Engage tabs, then push down. Tighten two screws (2).
6. Close cover (1).



1. COVER
2. SCREW (2)
3. SHUTTLE COVER
4. LOCKSCREW
5. LOCKSCREW
6. BUMPER, FRONT
7. BASE
8. BUMPER, REAR

Figure 5−28. Bumper Removal/Installation

5−34. Paper Feed Timing Belt (Figure 5−29)

a. Removal

1. Remove cabinet per paragraph 5−15a.
2. Remove two screws (1) and washers (2).
3. Separate belt shield (3) from side plate (4).
4. Loosen two hex screws (5) that hold motor (6).
5. Slide belt (7) off spline pulley (8) and motor pulley (9).

b. Installation

1. Slip belt (7) over spline pulley (8) and motor pulley (9).
2. Set belt tension per paragraph 5−9, 3 and 4.
3. Position belt shield (3) on side plate (4).
4. Install two screws (1) and washers (2).
5. Install cabinet per paragraph 5−15b.

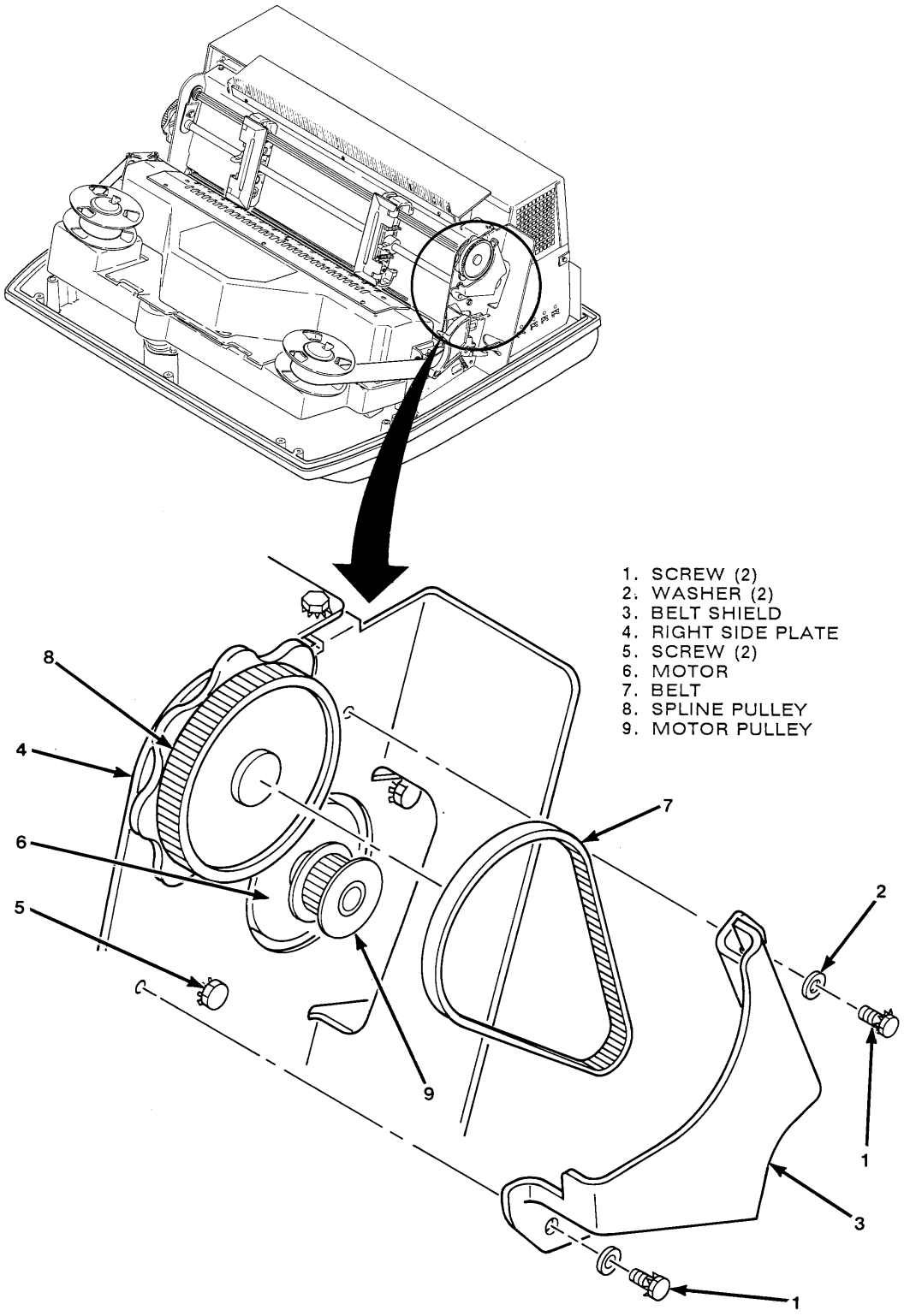


Figure 5−29. Paper Feed Timing Belt Removal/Installation

5−35. Paper Drive Motor (Figure 5−30)

a. Removal

1. Remove cabinet per paragraph 5−15a.
2. Loosen three screws (1) and remove EMI shield cover (2).
3. Disconnect P16 (3) from mechanism driver PCBA (4) and feed cable out of EMI shield (5).
4. Remove two screws (6) and washers (7).
5. Separate belt shield (8) from right side plate (9).
6. Remove four screws (10).
7. Separate barrier panel (11) from right side plate (9) and left side plate (12).
8. Remove two screws (13) and nuts (14).
9. Remove belt (15). Remove tie wraps as required and separate motor (16) from right side plate (9).

b. Installation

1. Position motor (16) on right side plate (9).
2. Install two screws (13) and nuts (14).
3. Align motor pulley per paragraph 5−10, steps 4 and 5.
4. Loosen two screws (13). Install belt (15).
5. Set belt tension per paragraph 5−9, steps 3 through 5. Retie cable as required.
6. Position barrier panel (11) on right side plate (9) and left side plate (12).
7. Install four screws (10).
8. Place belt shield (8) against right side plate (9).
9. Install two screws (6) and washers (7).
10. Feed connector P16 (3) through EMI shield (5) and connect to mechanism driver PCBA (4).
11. Install EMI shield cover (2). Tighten three screws (1).
12. Install cabinet per paragraph 5−15b.

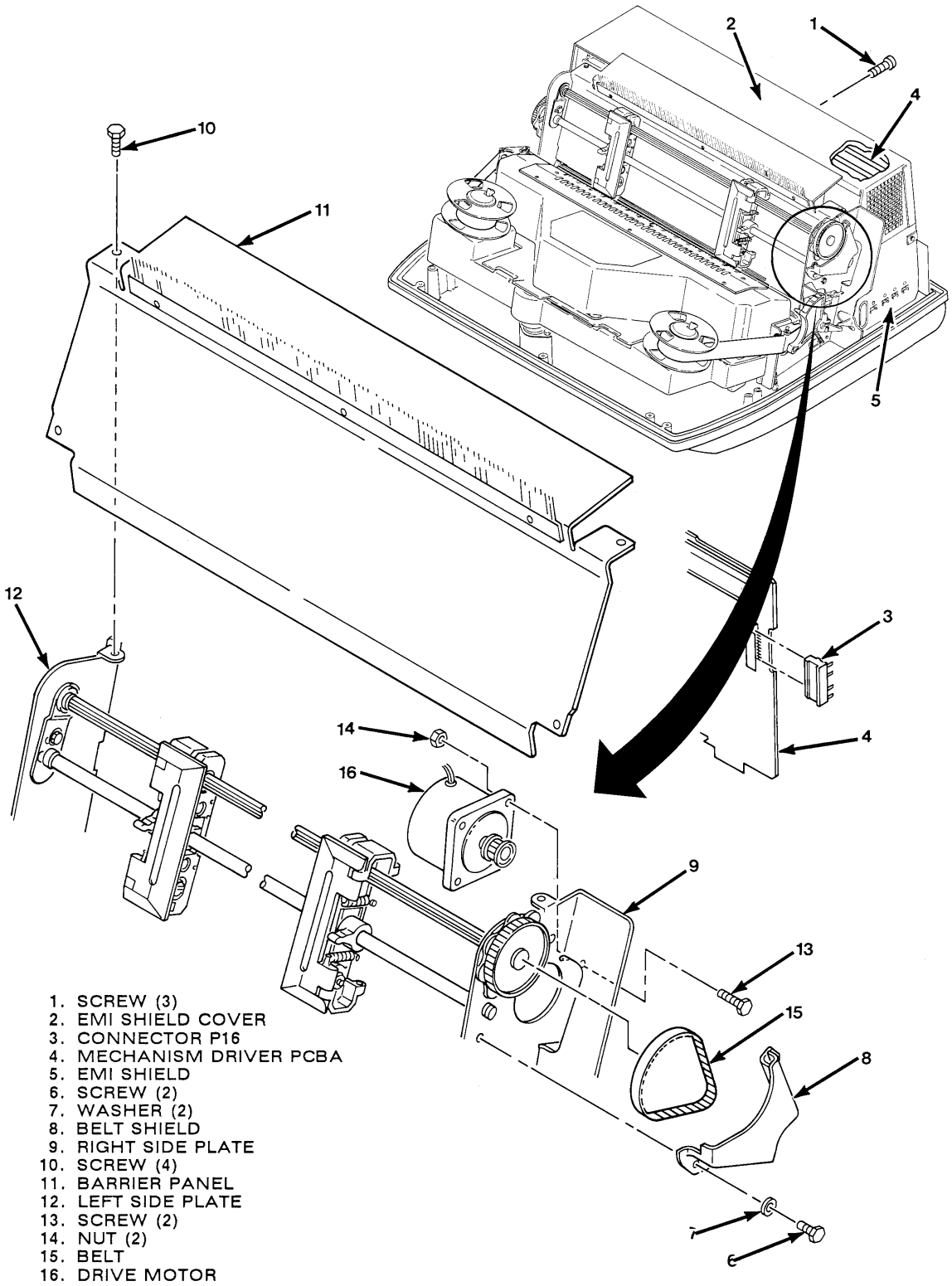


Figure 5−30. Paper Drive Motor Removal/Installation

5−36. Spline Shaft (Figure 5−31)

a. Removal

1. Remove cabinet per paragraph 5−15a.
2. With grip ring pliers, remove grip ring (1) from spline shaft (2).
3. Pull bearing (3) and spring link (6) with spring (4) off spline shaft (2).
4. Remove two screws (7) and washers (8).
5. Separate belt shield (9) from right side plate (10).
6. Remove belt (11).
7. Unlock left tractor (12) and right tractor (13) and slide to center of printer.
8. Remove screw (14) and bearing clamp (15).
9. Grasp spline shaft knob (16) and carefully slide spline shaft (2) to right and remove.

b. Installation

1. Open covers on left tractor (12) and right tractor (13). Position tractor belts so timing marks are at top on both tractors.
2. Grasp spline shaft knob (16) and slip spline shaft (2) through right side plate (10), tractors (12 and 13) and left side plate (5). Make sure that the same spline passes the marked groove on each tractor.
3. Install bearing clamp (15) and screw (14).
4. Slide spring link (6) with bearing (3) onto spline shaft (2).
5. Attach spring (4) between left side plate (5) and spring link (6).
6. Install grip ring (1) on spline shaft (2).
7. Install belt (11).
8. Set belt tension per paragraph 5−9, 3 and 4.
9. Position belt shield (9) on right side plate (10).
10. Install two screws (7) and washers (8).
11. Perform spline shaft skew adjustment per paragraph 5−11.
12. Install cabinet per paragraph 5−15b.

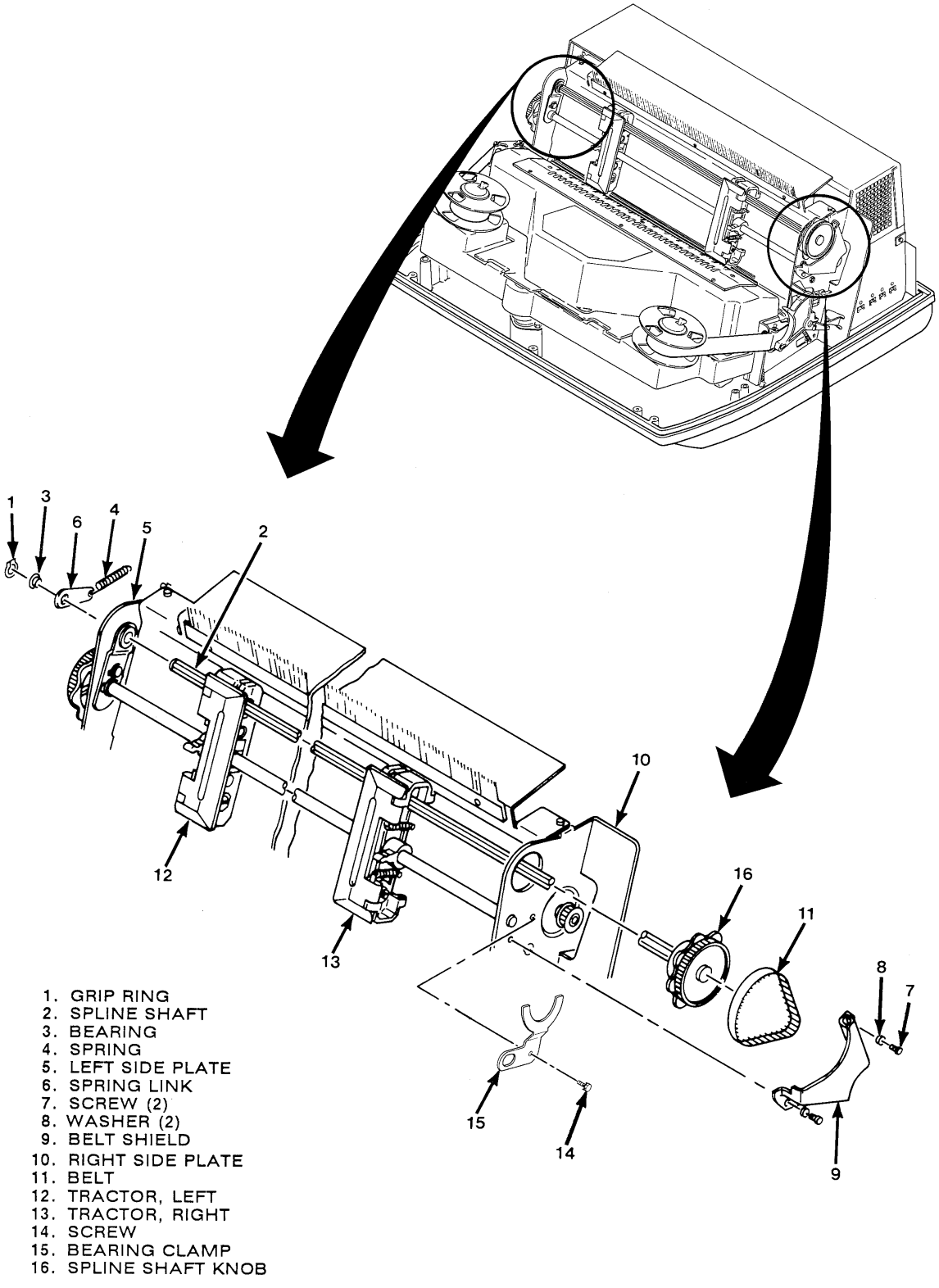


Figure 5−31. Spline Shaft Removal/Installation

5−37. Support Shaft (Figure 5−32)

a. Removal

1. Remove cabinet per paragraph 5−15a.
2. Unlock tractors (1). Slide to far left.
3. Remove E ring (2).
4. Slide assembly consisting of support shaft (3), two spring washers (4), bushing (5), adjusting knob (6), washer (7) and screw (8) to left, out of tractors (1) and left side plate (9).

b. Installation

1. Slide assembly consisting of support shaft (3), two spring washers (4), bushing (5), adjust knob (6), washer (7), and screw (8) into left side plate (9), through tractors (1) and right side plate (10)
2. Install E ring (2).
3. Position tractors (1) as desired.
4. Install cabinet per paragraph 5−15b.

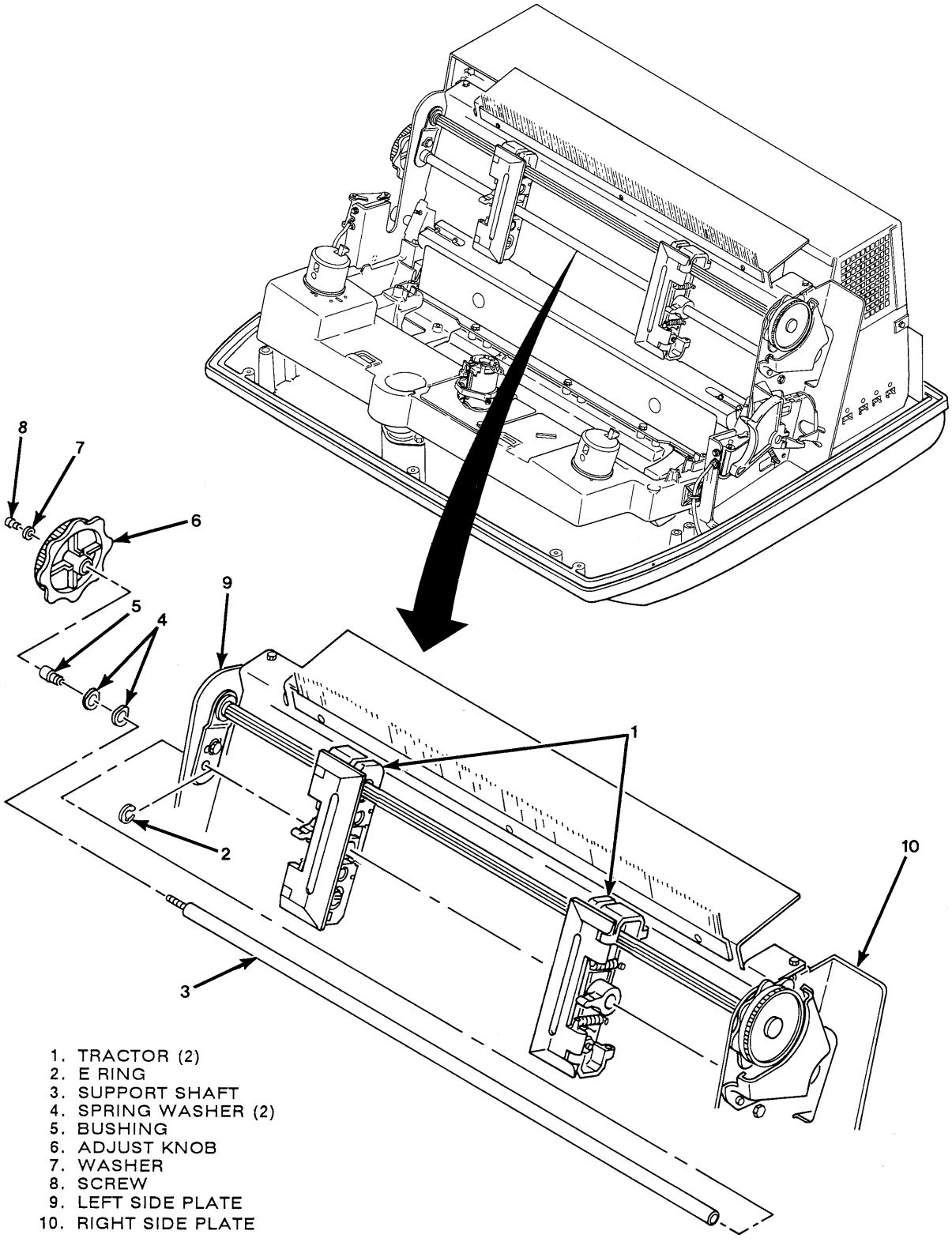


Figure 5−32. Support Shaft Removal/Installation

5−38. Tractor

a. Removal

1. Remove spline shaft per paragraph 5−36a.
2. Remove support shaft per paragraph 5−37a.
3. Remove tractors.

b. Installation

1. Using replacement tractors, install support shaft per paragraph 5−37b.
2. Install spline shaft per paragraph 5−36b.

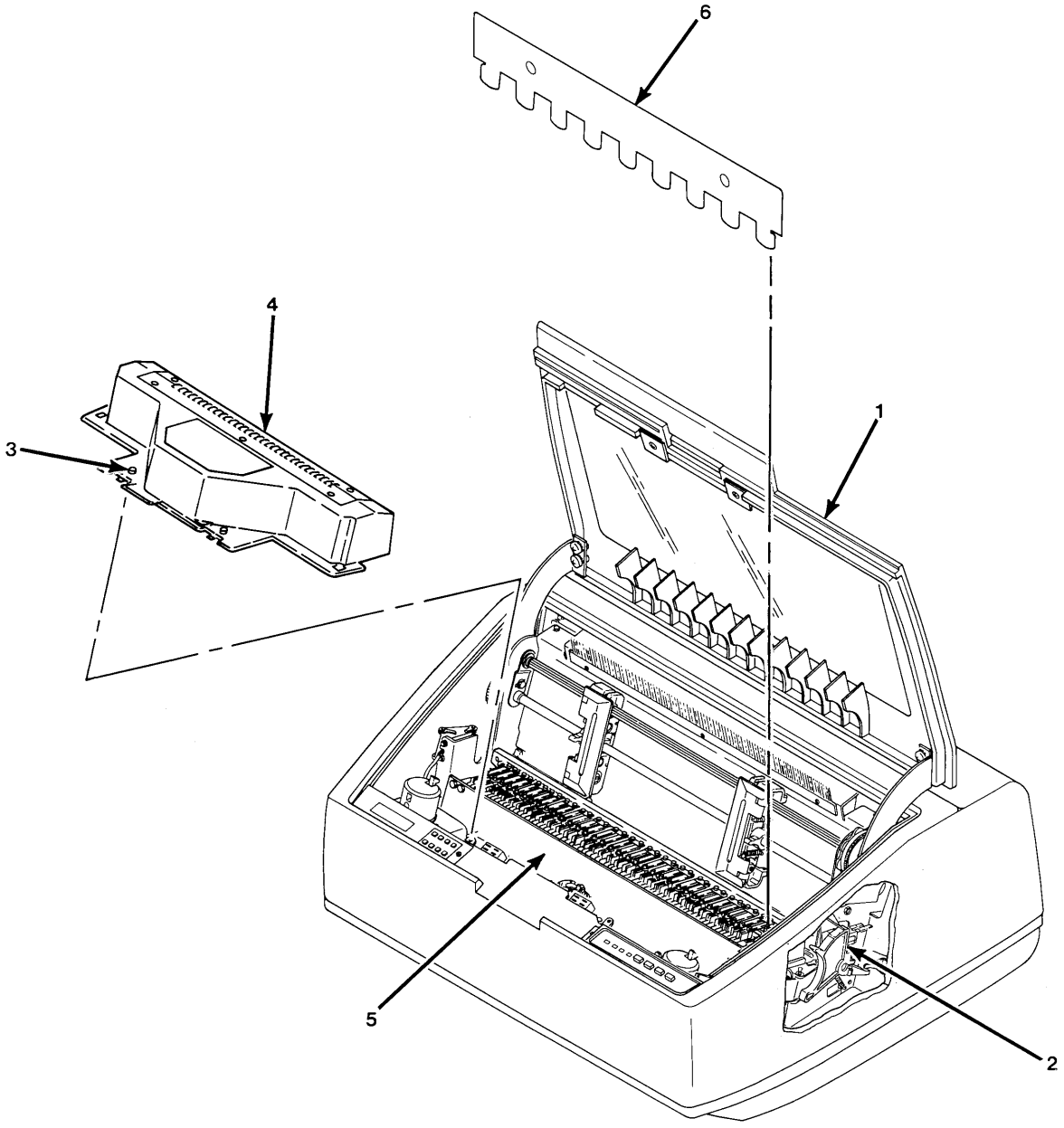
5−39. Paper Ironer (Figure 5−33)

a. Removal

1. Open cover (1).
2. Move forms thickness lever (2) to open position.
3. Loosen two screws (3). Remove shuttle cover (4) by grasping edges with both hands then lifting up and disengaging tabs.
4. Rotate shuttle (5) to service position.
5. Push back at ends of paper ironer (6) to disengage tabs, then lift up and out.

b. Installation

1. Push paper ironer (6) into slots until tabs engage.
2. Return shuttle (5) to normal position.
3. Install shuttle cover (4) by engaging tabs then pushing down. Tighten two screws (3).
4. Close forms thickness lever (2).
5. Close cover (1).



1. COVER
2. FORMS THICKNESS LEVER
3. SCREW (2)
4. SHUTTLE COVER
5. SHUTTLE
6. PAPER IRONER

Figure 5−33. Paper Ironer Removal/Installation

5−40. Platen (Figure 5−34)

a. Removal

1. Remove cabinet per paragraph 5−15a.
2. Remove paper ironer per paragraph 5−39a, 2 through 5.
3. Remove three screws (1).
4. Lift ironer mounting plate (2) from printer.
5. Loosen forms thickness lever retaining screw (3) and setscrew (4).
6. Slip forms thickness lever (5) off shaft of platen (6).
7. Disconnect spring (7) from right side plate (8).
8. Slide spring link (9) with bearing (10) off shaft of platen (6).
9. Remove screw (11) and washer (12).
10. Slide platen open switch bracket (13) off of shaft of platen (6).
11. Remove screw (14) and spacer (15).
12. Loosen platen restraint screw (16).
13. Slide restraint (17) off shaft of platen (6).
14. Disconnect spring (18) from left side plate (19).
15. Slide spring link (20) with bearing (21) off shaft of platen (6).
16. Move right end of platen (6) forward until it clears right side plate (8) then move platen to right until it clears left side plate (19).
17. Slide left platen adjustment bracket (22) and right platen adjustment bracket (23) and two washers (24) off shaft of platen (6). Do not reposition wear saddles (25).

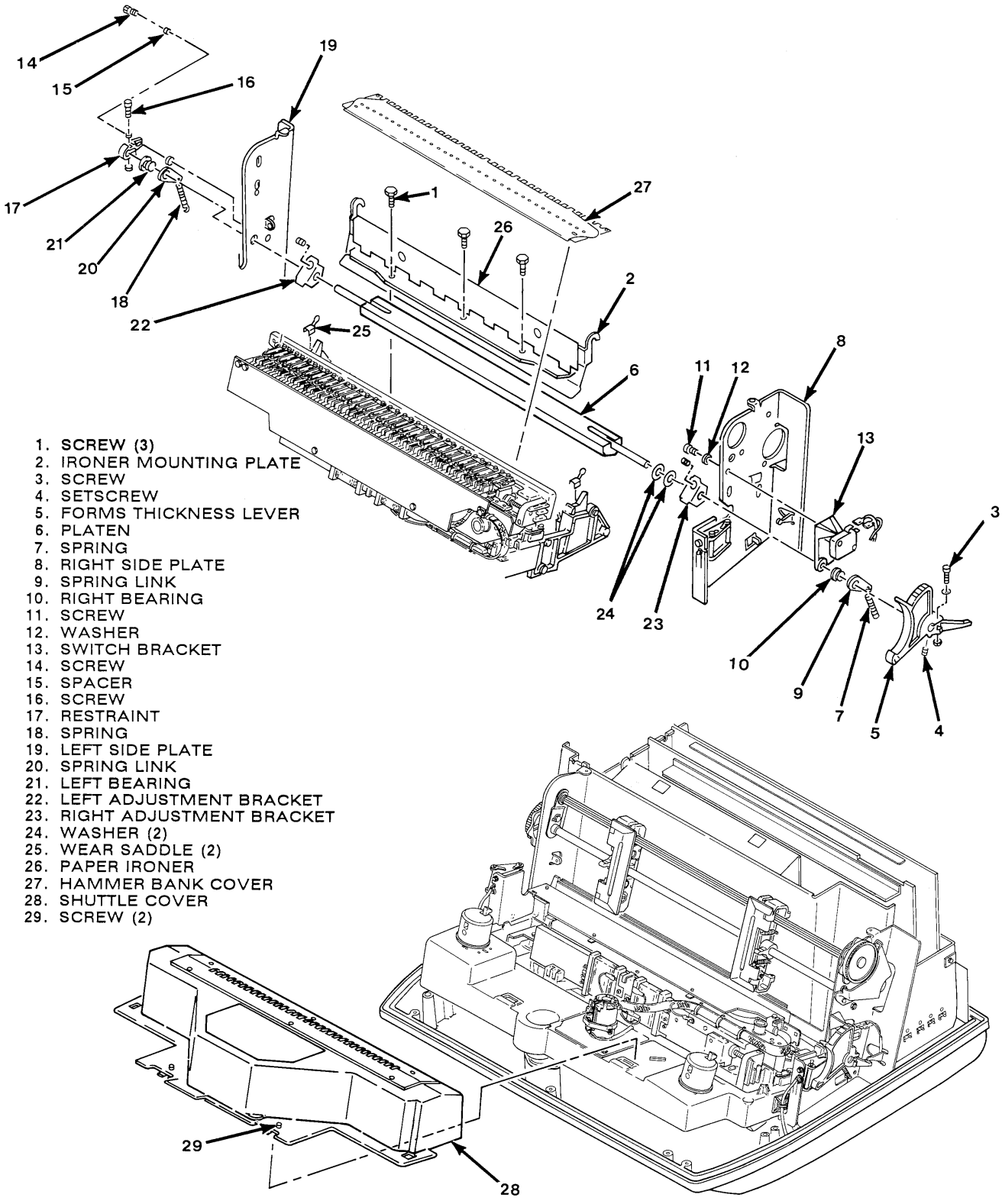


Figure 5−34. Platen Removal/Installation

5−40. Platen – continued

b. Installation

1. Slide left platen adjustment bracket (22) and right platen adjustment bracket (23) and two washers (24) onto shaft of platen (6).
2. Insert left end of platen (6) into left side plate (19). Slide platen to left then rotate right side into slot in right side plate (8).
3. Slide spring link (20) with bearing (21) onto shaft of platen (6).
4. Attach spring (18) to left side plate (19).
5. Slip restraint (17) onto shaft of platen (6)..
6. Install spacer (15) and screw (14). Tighten restraint screw (16)
7. Slide platen open switch bracket (13) onto shaft of platen (6).
8. Install screw (11) and washer (12).
9. Slide spring link (9) with bearing (10) onto shaft of platen (6).
10. Connect spring (7) to right side plate (8).
11. Slip forms thickness lever (5) onto shaft of platen (6).
12. Replace ironer mounting plate (2). Make sure hook over platen shaft is betwen two washers (24). Install three screws (1).
13. Install paper ironer (26) by aligning with slots in mounting plate (2) and pushing down.
14. Remove hammer bank cover (27).
15. Adjust platen angle per paragraph 5−12.
16. Adjust platen gap per paragraph 5−13, 4 through 11.
17. Install shuttle cover (28) by engaging tabs then pressing down. Tighten two screws (29).
18. Install paper, apply power, and verify print quality by printing repeating patterns. Install cabinet per paragraph 5−15b.

5−41. Interlock Cable Assembly (Figure 5−35)

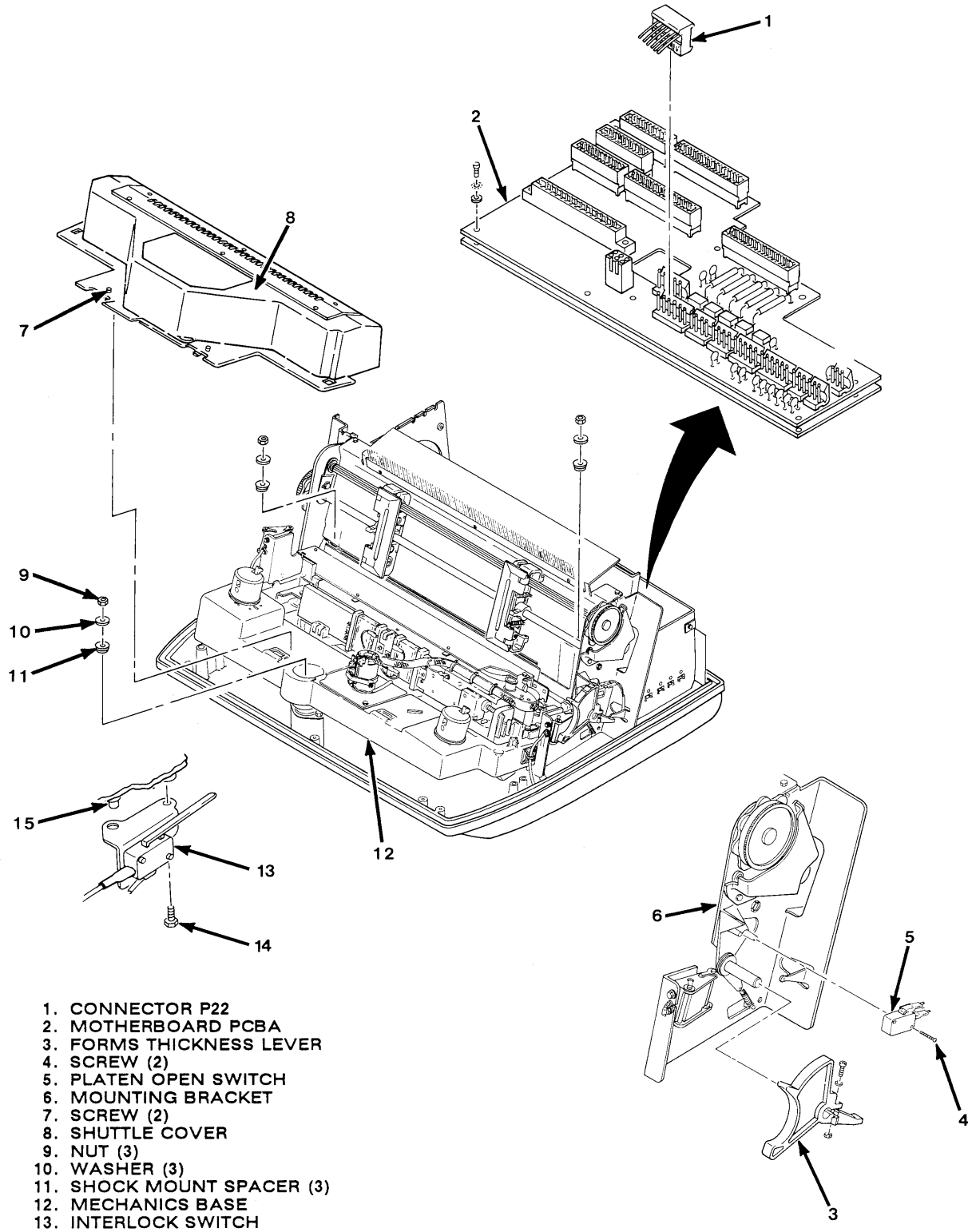
a. Removal

1. Remove controller, mechanism driver, and power supply PCBAs per paragraphs 5−20a, 21a, and 22a.
2. Disconnect P22 (1) from motherboard PCBA (2).
3. Move forms thickness lever (3) to fully closed position.
4. Remove two screws (4).

5. Separate platen open switch (5) from mounting bracket (6).
6. Loosen two screws (7). Grasp shuttle cover (8) at both ends. Lift up and out.
7. Remove three nuts (9), washers (10), and shock mount spacers (11).
8. Raise machined mechanics base (12) to gain access to interlock switch (13).
9. Remove hex screw (14) and lift switch (13) off pin (15).
10. Remove spot ties as necessary and separate switches (5 and 13) and attached cable from mechanics base (12).

b. Installation

1. Place switches (5 and 13) and attached cable in position in mechanics base (12).
2. Position interlock switch (13) on underside of mechanics base (12) on pin (15).
3. Install hex screw (14).
4. Place switch (5) on mounting bracket (6).
5. Install two screws (4).
6. Connect P22 (1) to motherboard PCBA (2). Retie cable as required.
7. Install three nuts (9), washers (10), and shock mount spacers (11).
8. Engage tabs on shuttle cover (8) then press down. Tighten two screws (7).
9. Install controller, mechanism driver, and power supply PCBAs per paragraphs 5−20b, 21b, and 22b.



1. CONNECTOR P22
2. MOTHERBOARD PCBA
3. FORMS THICKNESS LEVER
4. SCREW (2)
5. PLATEN OPEN SWITCH
6. MOUNTING BRACKET
7. SCREW (2)
8. SHUTTLE COVER
9. NUT (3)
10. WASHER (3)
11. SHOCK MOUNT SPACER (3)
12. MECHANICS BASE
13. INTERLOCK SWITCH
14. HEX SCREW
15. PIN

Figure 5−35. Interlock Cable Assembly Removal/Installation

5−42. Paper Detect Switch (Figure 5−36)

NOTE: If necessary to gain working room, remove front and left rear shock mount screw and screw on left braided strap then shift printer base forward.

a. Removal

1. Remove cabinet per paragraph 5−15a.
2. Remove controller, mechanism driver, and power supply PCBAs per paragraphs 5−20a, 21a, and 22a.
3. Disconnect P25 (1) from motherboard PCBA (2).
4. Remove four screws (3) and barrier panel (4).
5. Loosen two screws (5).
6. Separate paper detect switch (6) from base casting (7). Cut cable ties as necessary and remove from printer.

b. Installation

1. Install paper detect switch (6) on base casting (7) Under two screws (5).
2. Tighten two screws (5). Make sure switch (6) is parallel with paper ironer.
3. Install barrier panel (4) and four screws (3).
4. Connect P25 (1) to motherboard PCBA (2). Retie wire as necessary.
5. Install controller, mechanism driver, and power supply PCBAs per paragraphs 5−20b, 21b, and 22b.
6. Install cabinet per paragraph 5−15b.

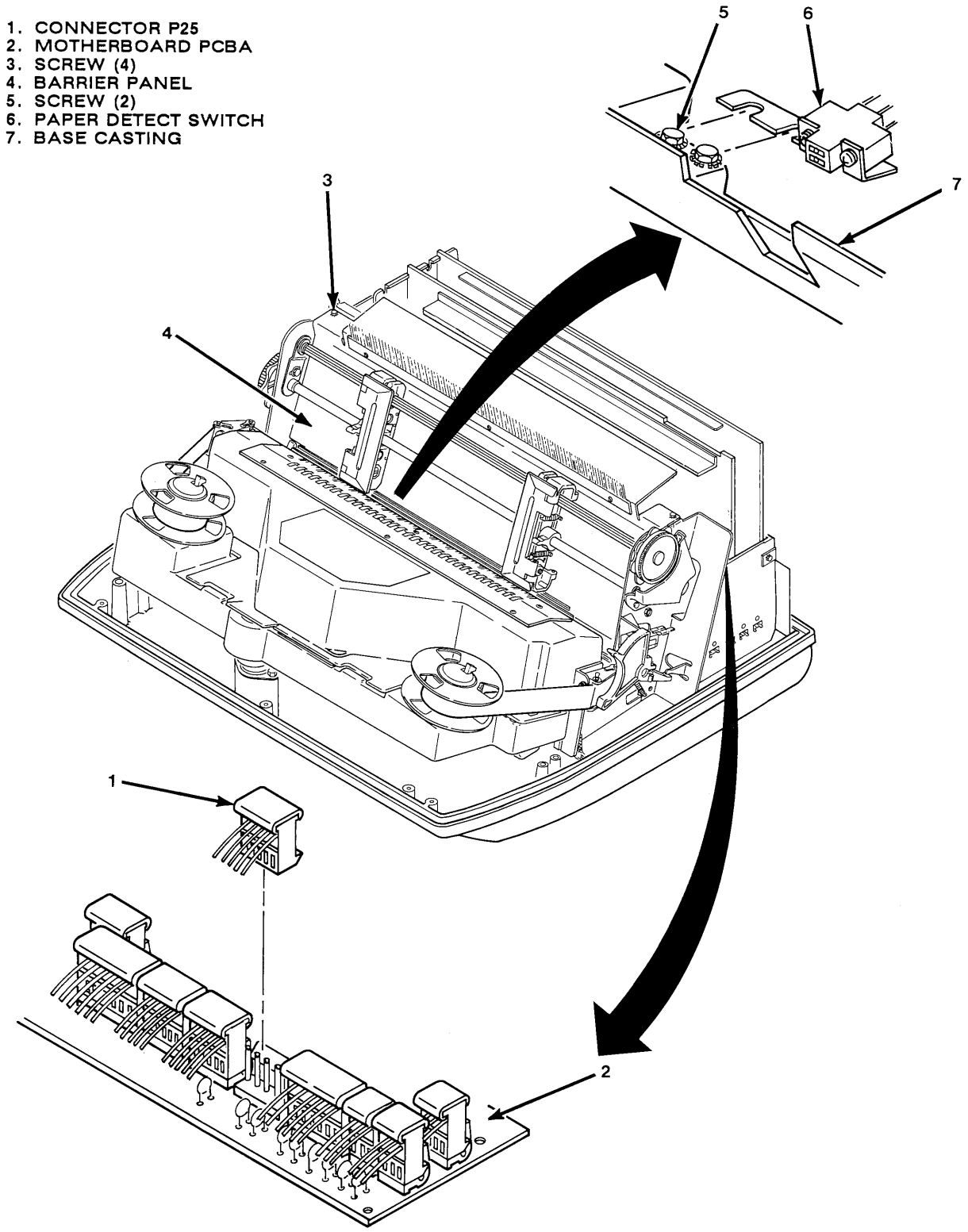


Figure 5−36. Paper Detect Switch Removal/Installation

5−43. Ribbon Drive Motor (Figure 5−37)

❑ CAUTION ❑

Mounting screws for left and right motors are of different lengths. do not interchange screws −− damage to motor is possible.

a. Removal

NOTE: Procedure below is for left drive motor. Procedure for right drive motor is identical, except disconnect P29 in step 4.

1. Remove cabinet per paragraph 5−15a and shuttle cover per paragraph 5−23a.
2. Remove PCBAs per paragraphs 5−20a, 21a, and 22a.
3. Raise forms thickness lever (1) to full open position.
4. Disconnect P28 (2) from motherboard PCBA (3).
5. Cut tie wraps as necessary and remove cable.
6. Loosen screw (4) in ribbon spool hub (5).
7. Lift hub (5) from shaft of motor (6).
8. Hold motor (6) and remove three screws (7) and washers (8).
9. Separate motor (6) and its cable from base casting (9).

b. Installation

NOTE: Procedure below is for left drive motor. Procedure for right drive motor is identical except, connect P29 in step 6.

1. Position motor (6) in base casting (9).
2. Hold motor (6) while installing three screws (7) and washers (8).
3. Place hub (5) over shaft of motor (6).
4. Tighten screw (4) in spool hub (5). Make sure screw contacts flat of motor shaft.
5. Route cable of motor (6) to motherboard PCBA (3).
6. Connect P28 (2) to motherboard PCBA (3). Resecure cable as necessary.
7. Install PCBAs per paragraphs 5−20b, 21b, and 22b.
8. Install cabinet per paragraph 5−15b and shuttle cover per paragraph 5−23b.

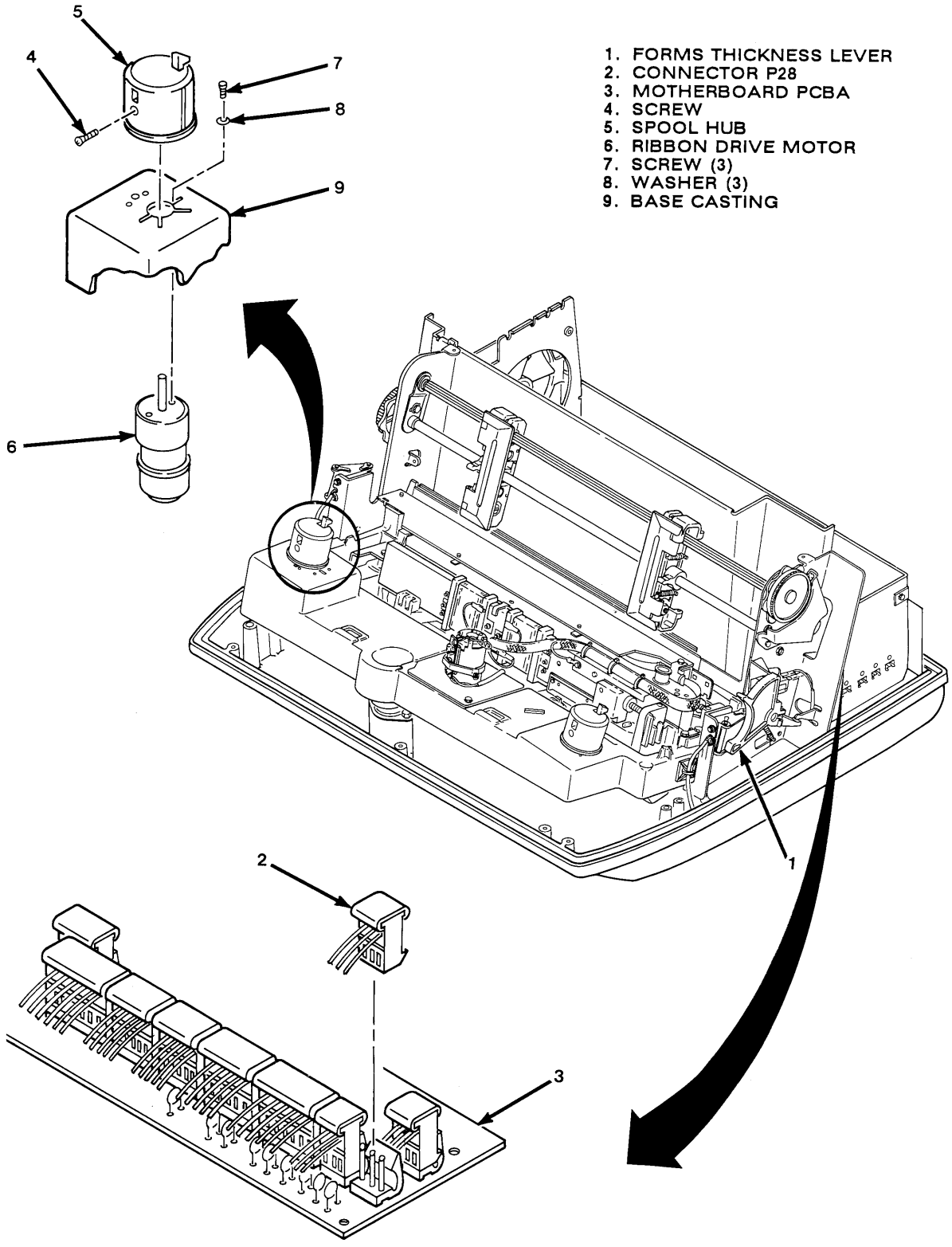


Figure 5−37. Ribbon Drive Motor Removal/Installation

5−44. Ribbon Guide (Figure 5−38)

a. Removal

NOTE: The following procedure is for the left ribbon guide. The procedure for the right guide is identical, except disconnect P23 in step 5.

1. Remove cabinet per paragraph 5−15a.
2. Raise forms thickness lever (1) to open position.
3. Remove ribbon (2).
4. Remove major PCBAs per paragraphs 5−20a, 21a, and 22a.
5. Disconnect connector P24 (3) from motherboard PCBA (4).
6. Cut spot ties as required to free ribbon guide cable.
7. Remove two screws (5) and flat washers (6).
8. Slide ribbon guide (7) out of left side plate (8). Remove guide (7) and its cable from printer.

b. Installation

NOTE: The following procedure is for the left ribbon guide. The procedure for the right guide is identical, except connect P23 in step 4.

1. Slide ribbon guide (7) into left side plate (8).
2. Install two screws (5) and flat washers (6).
3. Route cable to motherboard PCBA (4).
4. Connect P24 (3) to motherboard PCBA (4). Retie cable as necessary.
5. Install PCBAs per paragraphs 5−20b, 21b, and 22b.
6. Align guides per paragraph 5−14.
7. Install cabinet per paragraph 5−15b.

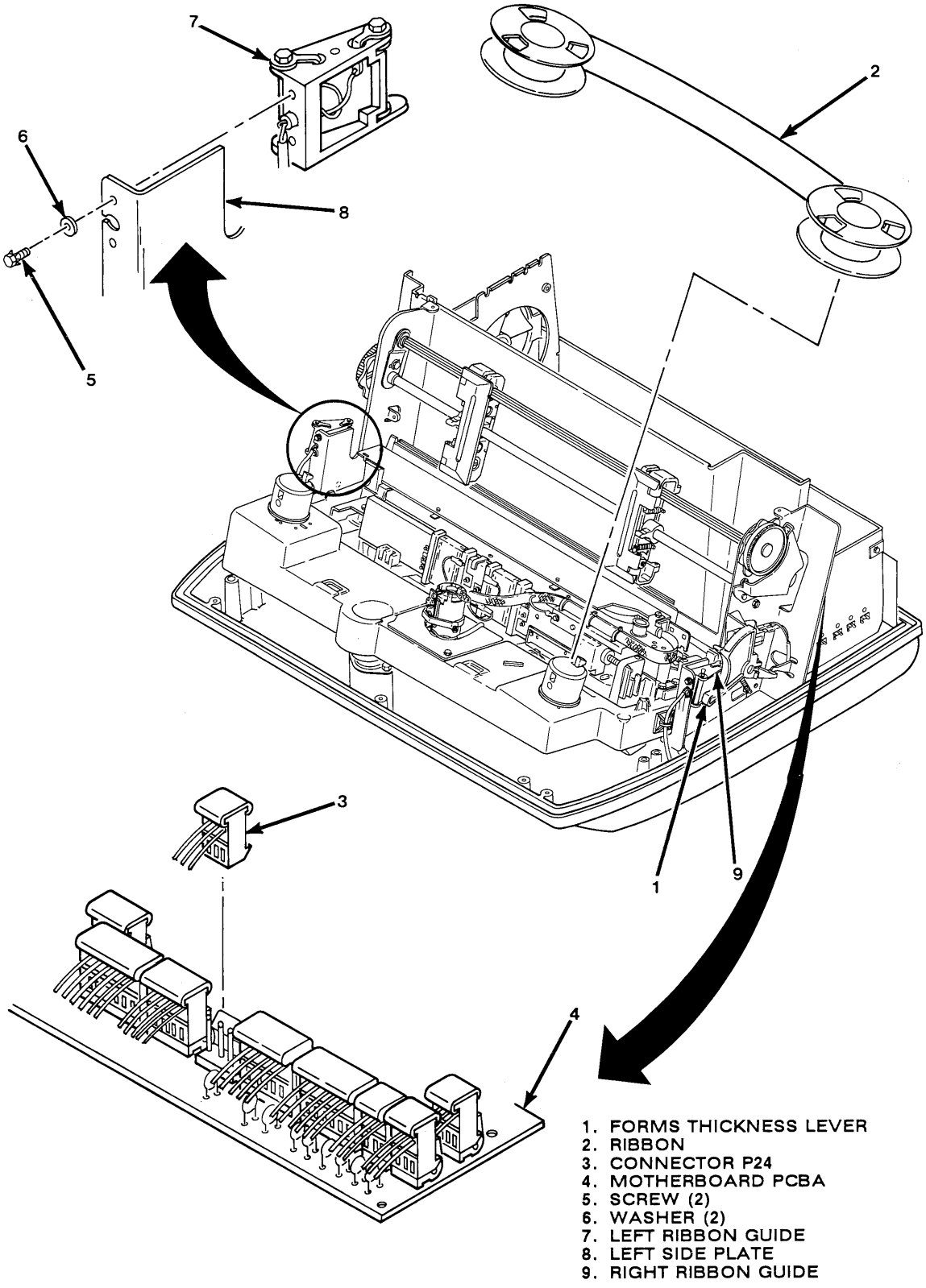


Figure 5−38. Ribbon Guide Removal/Installation

5−45. Blower Assembly (Figure 5−39)

a. Removal

1. Remove cabinet per paragraph 5−15a.
2. Loosen two screws (1). Grasp shuttle cover (2) at both edges; lift up to remove.
3. Disconnect connector P27 (3) from motherboard PCBA (4).
4. Feed cable around right side and up through hole in center of base casting (5).
5. Remove two screws (6).
6. Separate blower assembly (7) from base casting (5).

b. Installation

1. Place blower assembly (7) in base casting(5).
2. Install two screws (6).
3. Feed connector P27 (3) through hole in center of base casting (5) and over to motherboard PCBA (4).
4. Connect connector P27 (3) to motherboard PCBA (4).
5. Engage tabs on shuttle cover (2) then press down to seat. Tighten two screws (1).
6. Install cabinet per paragraph 5−15b.

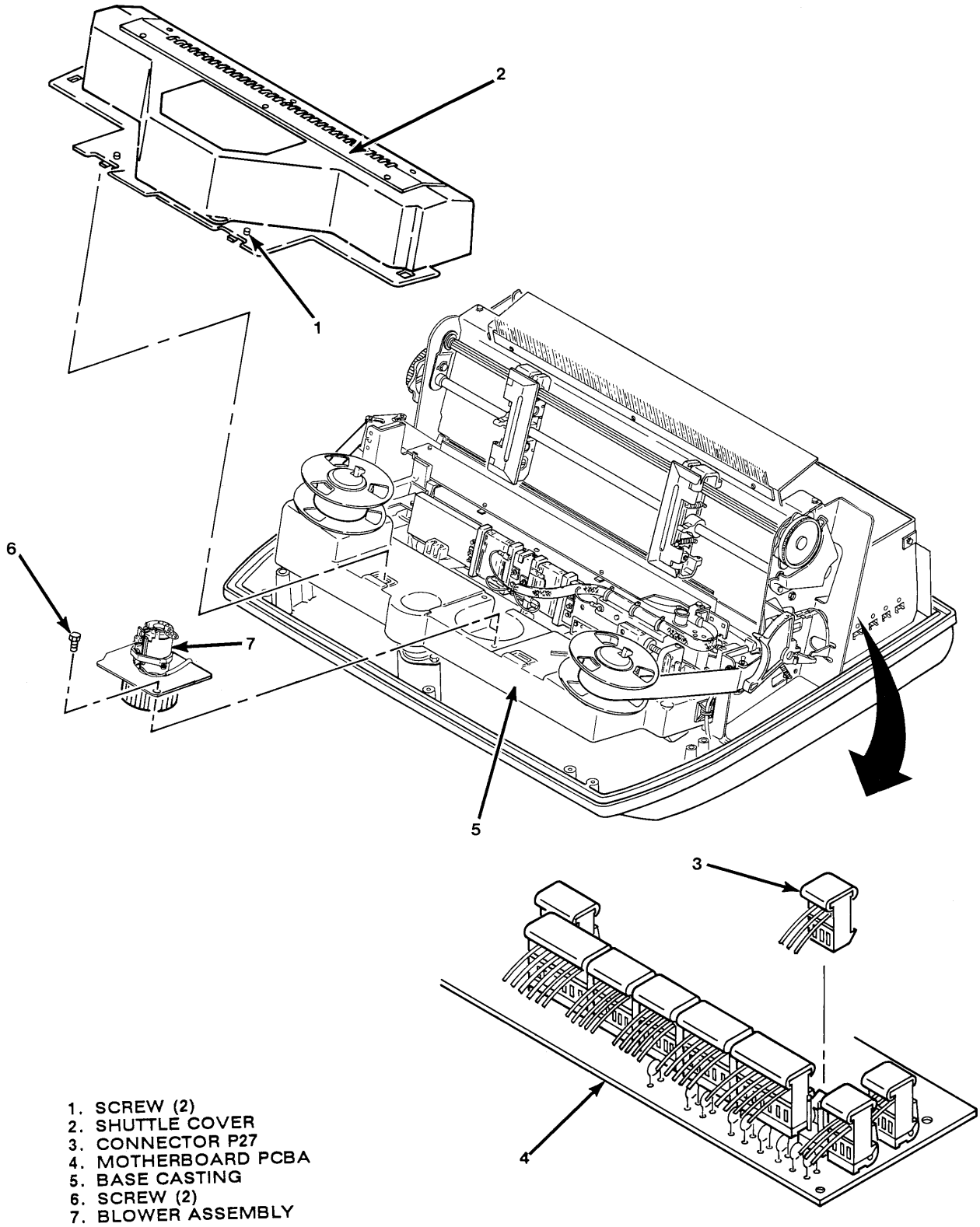


Figure 5−39. Blower Assembly Removal/Installation

5−46. Fan (Figure 5−40)

a. Removal

1. Remove cabinet housing per paragraph 5−15a.
2. Remove controller and power supply PCBAs per paragraphs 5−20a and 22a. Remove any optional PCBA.
3. Remove three screws (1).
4. Cut tie wraps as necessary to free wires to fan assembly (2).
5. Separate fan (2) from fan mount (3).

b. Installation

1. Place fan (2) against fan mount (3).
2. Install three screws (1).
3. Retie wires as necessary.
4. Install controller and power supply PCBAs per paragraphs 5−20b and 22b. Install any optional PCBA.

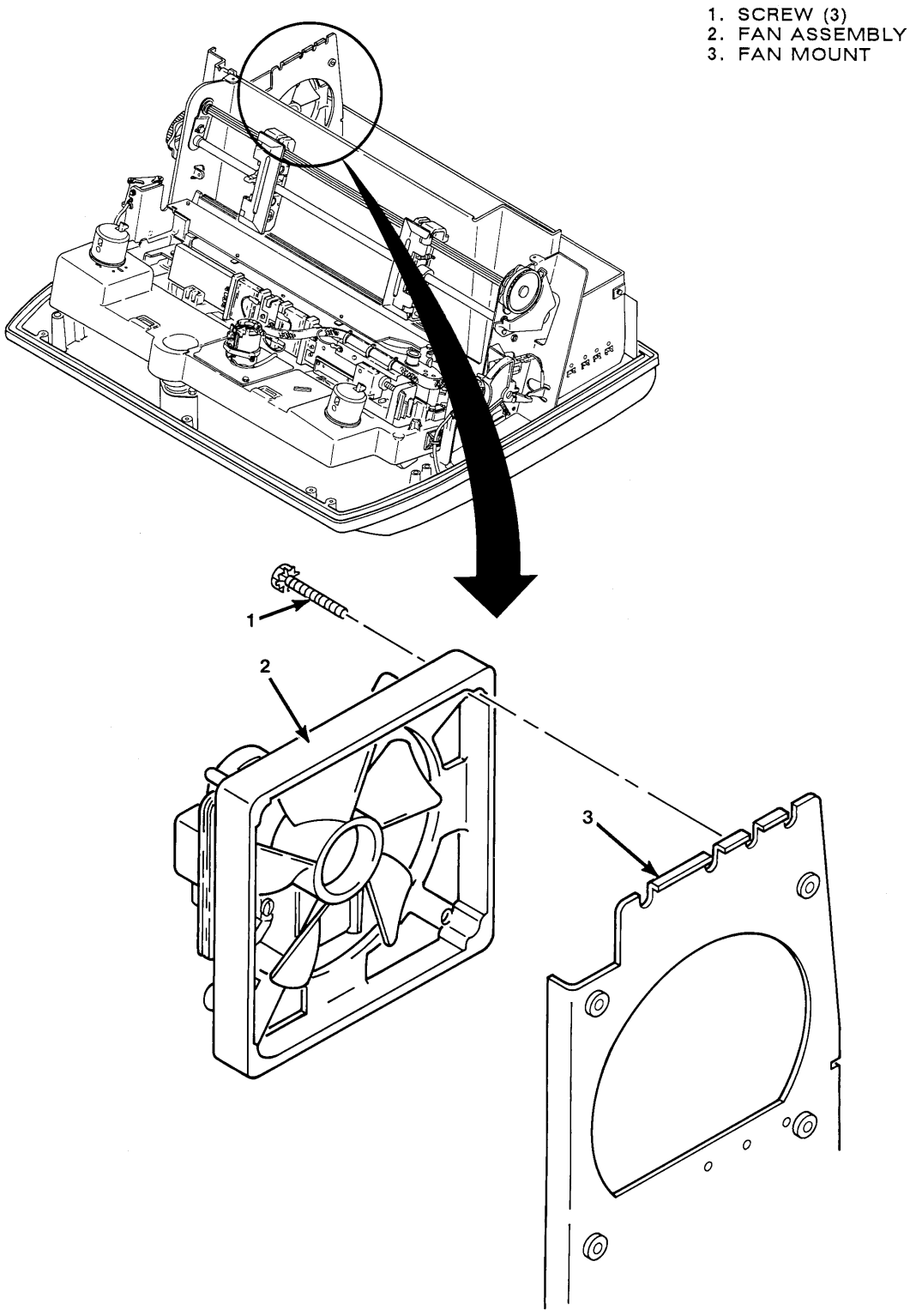


Figure 5−40. Fan Removal/Installation

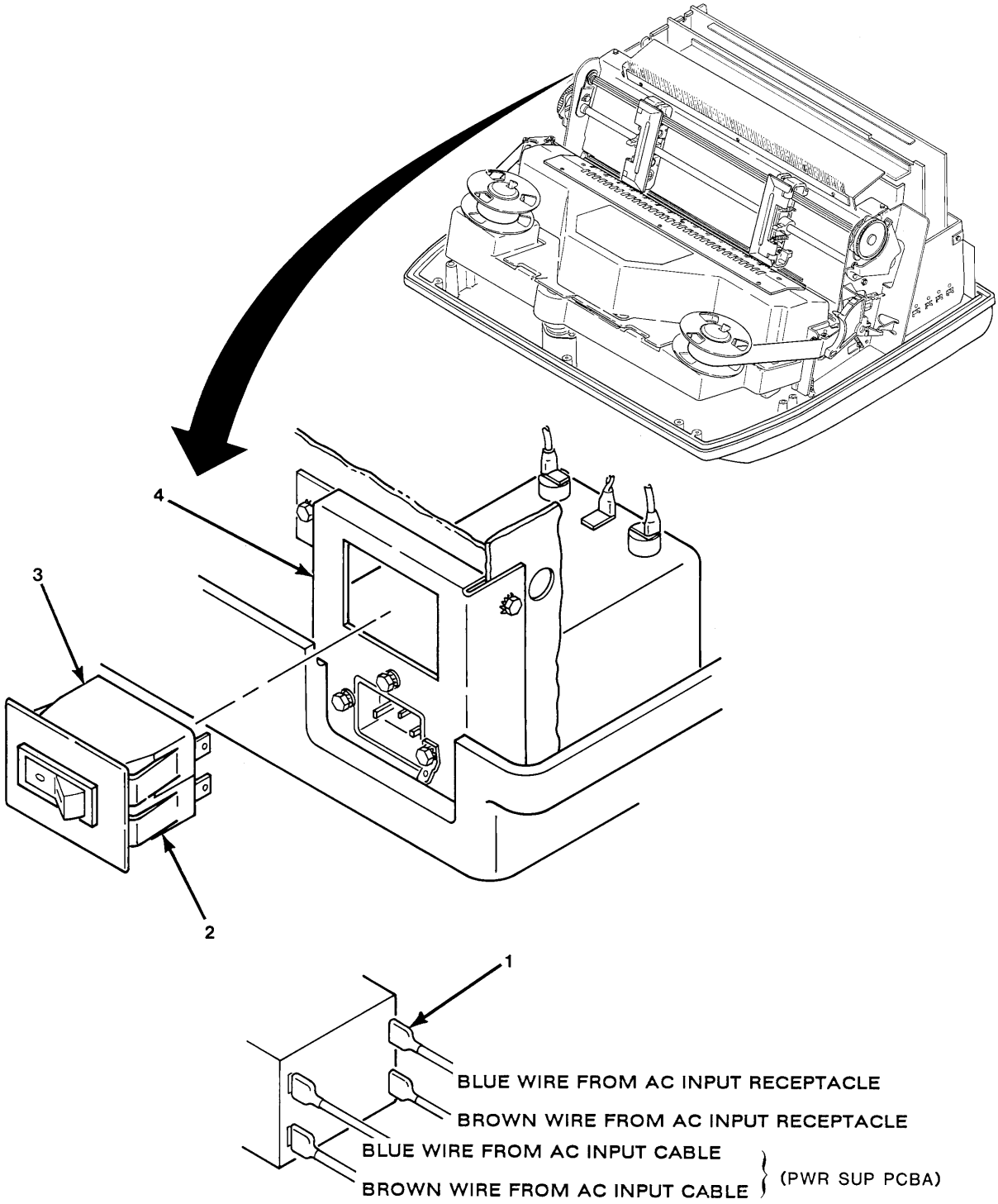
5−47. Circuit Breaker (Figure 5−41)

a. Removal

1. Remove cabinet per paragraph 5−15a and EMI shield cover per paragraph 5−20a, step 3.
2. Disconnect four lead connectors (1).
3. Press in on spring clips (2) and push circuit breaker (3) out of mounting plate (4).

b. Installation

1. Press circuit breaker (3) into mounting plate (4) until spring clips (2) snap into place.
2. Connect four lead connectors (1).
3. Install EMI shield cover per paragraph 5−20b, step 5 and cabinet per paragraph 5−15b.



1. LEAD CONNECTORS
2. SPRING CLIP (4)
3. CIRCUIT BREAKER
4. MOUNTING PLATE

Figure 5−41. Circuit Breaker Removal/Installation

5−48. AC Input Filter (Figure 5−42)

a. Removal

1. Remove cabinet per 5−15a.
2. Remove EMI shield per paragraph 5−20a3.
3. Remove circuit breaker per paragraph 5−47a.
4. Remove nut (1), terminal lug (2), and star washer (3) from EMI shield (4).
5. Tag and remove two terminal connectors (5).
6. Remove two screws (6) and washers (7).
7. Remove screw (8), terminal tab (9), and star washer (10).
8. Remove two screws (11).
9. Remove mounting plate (12) and input filter (13) from printer.

b. Installation

1. Place input filter (13) and mounting plate (12) in place in printer.
2. Install two screws (11).
3. Install screw (8), terminal tab (9), and star washer (10).
4. Install screws (6) and washer (7).
5. Install two terminal connectors (5).
6. Install nut (1), terminal lug (2), and star washer (3).
7. Install circuit breaker per paragraph 5−47b.
8. Install EMI shield per paragraph 5−20b7.
9. Install cabinet per 5−15b.

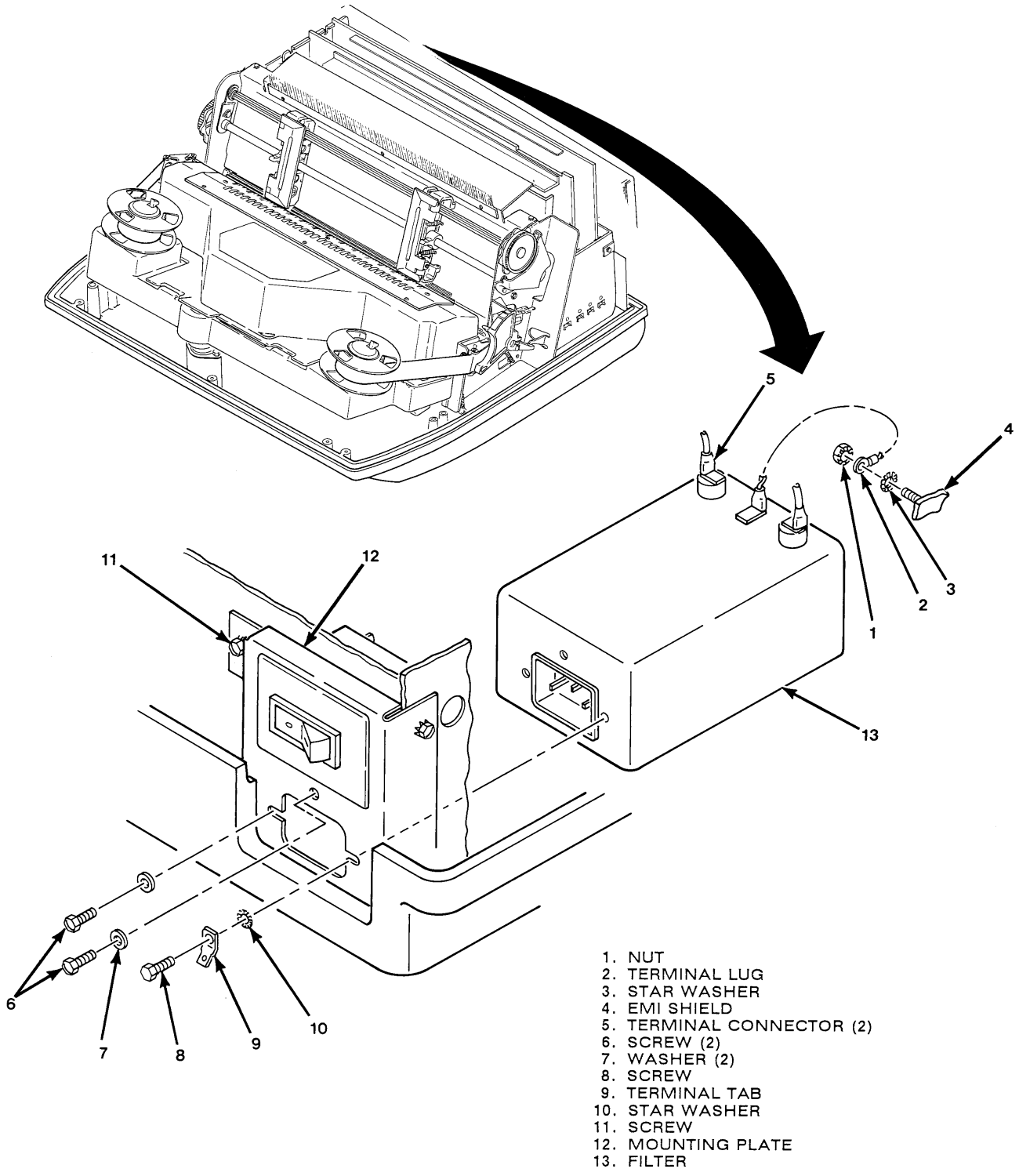


Figure 5−42. AC Input Filter Removal/Installation

5−49. Paper Feed Motor Pulley (Figure 5−43)

a. Removal

1. Remove timing belt per paragraph 5−34a.
2. Loosen two set screws (1) on motor pulley (2).
3. Slide motor pulley (2) off shaft of motor (3).

b. Installation

1. Slide motor pulley (2) onto shaft of motor (3).
2. Tighten two set screws (1) on motor pulley (2).
3. Install timing belt per paragraph 5−34b. Align pulley during belt installation per paragraph 5−10.

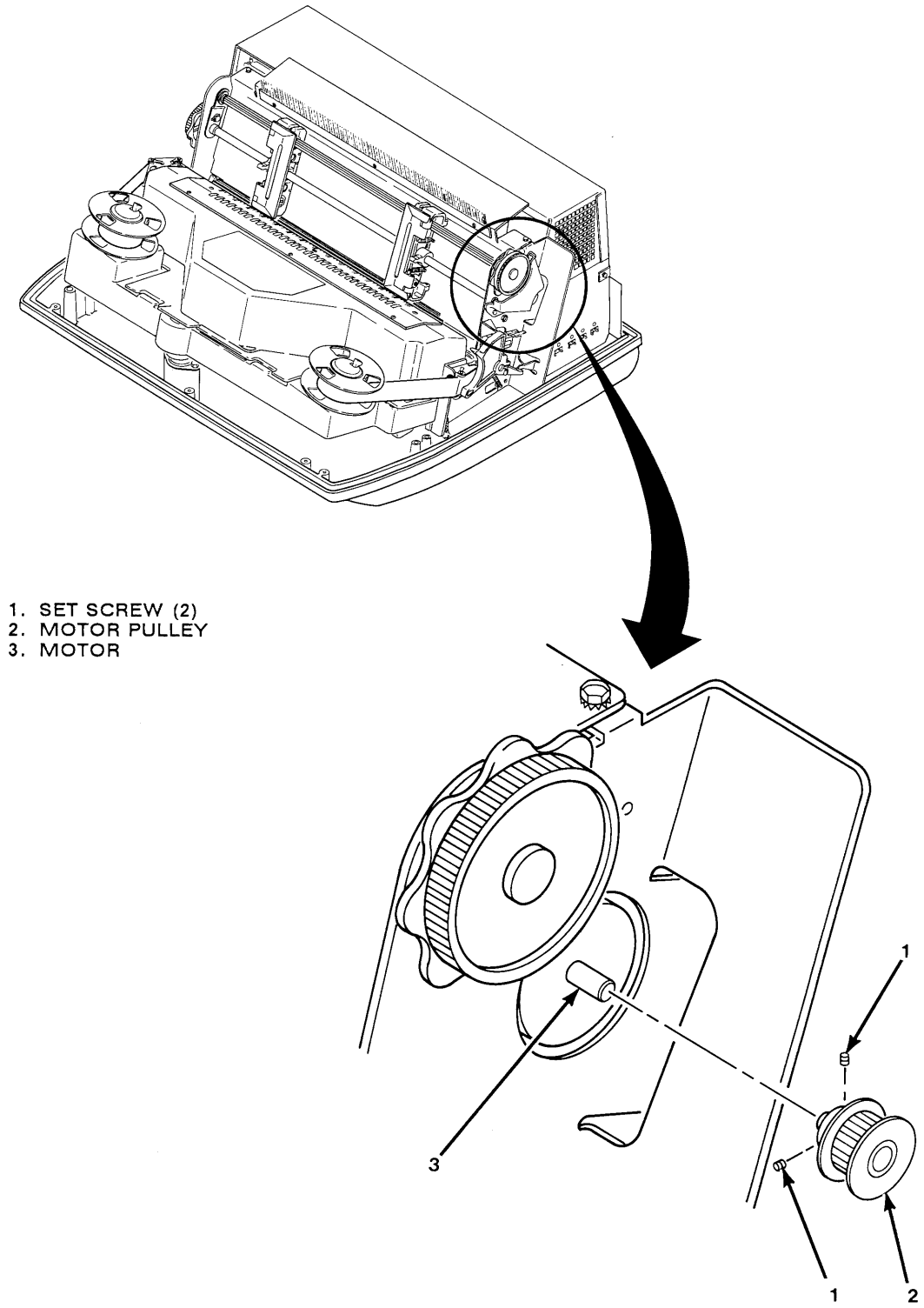


Figure 5−43. Paper Feed Motor Pulley Removal/Installation

APPENDIX A

ELECTRONIC DRAWINGS

In accordance with *Printronix* policy, schematic drawings are no longer provided in the Maintenance Manual.

APPENDIX B

PARTS LIST

(cross referenced to Chapter 5, Section III art)

B−1. The following table contains a parts listing for items that appear in the illustrations of Chapter 5, Section III (Maintenance, Replacement). Please note the following:

1. **Parts not appearing in Chapter 5 will not be listed.**
2. **Not all parts listed are available.**
3. **Some parts listed may not be field replaceable.**

TABLE B−1. PARTS LIST

FIGURE AND TITLE ITEM NO/NAME	PART NO/COMMENTS
Figure 5−11. Cabinet Removal/Installation	
1. POWER CORD	101512−001
2. COVER	111702−001
3. SCREW (2)	140059−001
4. CONTROL PANEL	111421−001
5. DISPLAY CONTROL PANEL	111485−001
6. SCREW, PHILLIPS (2)	108732−001
7. SCREW PHILLIPS (2)	105839−001
8. WASHER, FINISHING (2)	105838−001
9. CABINET (ASSY)	111091−001
10. BASE	111365−003, 112083−003
Figure 5−12. Control Panel Removal/Installation	
1. POWER CORD	102512−001
2. COVER	111702−001
3. SCREW	140059−001
4. CONTROL PANEL	111421−001
5. CABINET (ASSY)	111091−001
6. CONNECTOR P31	(part of item 4)
Figure 5−13.Cover Removal/Installation	
1. POWER CORD	102512−001
2. COVER	111702−001
3. PHILLIPS HEAD SCREW (4)	103677−023
4. LOCKWASHER (4)	101527−002
5. HINGE (2)	111857−001 & −002
Figure 5−14. Display Control Panel Removal/Installation	
1. POWER CORD	102512−001
2. COVER	111702−002
3. SCREW	140059−001
4. DISPLAY CONTROL PANEL	111485−001
5. CABINET	111091−001
6. CONNECTOR P1	(part of item 4)

TABLE B−1. PARTS LIST−continued

FIGURE AND TITLE ITEM NO/NAME	PART NO/COMMENTS

Figure 5−15. Control Panel Cable Removal/Installation

1.	CONNECTOR P1	(part of item 2)
2.	DISPLAY CONTROL PANEL	111485−001
3.	CONNECTOR P31	(part of item 4)
4.	CONTROL PANEL	111421−001
5.	SCREW, HEX (2)	102786−408
6.	WASHER (2)	101526−005
7.	CONNECTOR J3	(part of item 11)
8.	SCREW, HEX (10)	102786−406
9.	PCBA, MOTHERBOARD	111499−001
10.	INSULATOR	112010−001
11.	CABLE	111540−001
12.	BASE	111365−003, 112083−003

Figure 5−16. Controller and Mechanism DriverRemoval/Installation

1.	CONNECTOR I/O	n/a
2.	SCREW (3)	102559−136
3.	EMI SHIELD COVER	111430−001
4.	PARALLEL CONTROLLER PCBA	111951−001
5.	LATCH (2)	(part of item 6)
6.	CONNECTOR P4	(part of item 4)
7.	CONNECTOR J4	(part of item 10)
8.	BASE	111365−003, 112083−003
9.	MECHANISM DRIVER PCBA	111687−001
10.	CABLE	n/a
11.	CONNECTOR P16	(part of cable not shown)

Figure 5−17. Controller PROM Locations

1.	DCU PROGRAM PROM (2)	117178−001(13D) −002 (12D)
2.	MCU PROGRAM PROM	117177−001(6D)
3.	FONT PROM (2)	117774−001(14D) −002(15D)
4.	HOST TERMINATING RESISTORS	varies with configuration
5.	MEMORY PAGING PROM	140234−001

Figure 5−18. Power Supply PCBA Removal/Installation

1.	SCREW (3)	102559−136
2.	EMI SHIELD COVER	111430−001
3.	FLAP, PROTECTIVE	(part of item 8)
4.	CONNECTOR J18	n/a
5.	CONNECTOR J1	(part of item 8)
6.	CONNECTOR J19	n/a
7.	CONNECTOR J2	(part of item 8)
8.	POWER SUPPLY PCBA (ASSY)	111688−001
9.	BASE	111365−003, 112083−003

FIGURE AND TITLE ITEM NO/NAME	PART NO/COMMENTS
Figure 5−19. Shuttle Cover and Paper Scale Removal/Installation	
1. COVER	111702−001
2. FORMS THICKNESS LEVER	111724−001
3. SPOOL LATCH (2)	(part of item 5)
4. SPOOL (2)	n/a
5. SPOOL HUB (2)	102526−001
6. SCREW (2)	140058−001
7. SHUTTLE COVER	111790−001
8. TABS, REAR (2)	n/a
9. SLOTS, FRONT (2)	n/a
10. SLOTS, SIDE (2)	n/a
11. TABS, SIDE (2)	(part of item 7)
12. SCREW, BUTTON HEAD (6)	102288−003
13. LOCKNUT (6)	101853−003
14. PAPER SCALE	110277−001
Figure 5−20. Motherboard PCBA Removal/Installation	
1. CONNECTORS	(part of other assys)
2. MOTHERBOARD PCBA	111499−001
3. SCREW (10)	102786−406
4. WASHER (10)	101526−001
5. INSULATOR	112010−001
6. BASE	111365−003, 112083−003
Figure 5−21. I/O Cable Removal/Installation	
1. SCREW (2)	102786−604
2. MOUNTING PLATE	(part of item 3)
3. CABLE (ASSY)	111486−001
Figure 5−22. Shuttle Assembly Removal/Installation	
1. SCREW (2)	140058−001
2. SHUTTLE COVER	111790−001
3. CONNECTOR P21	(part of item 2)
4. MOTHERBOARD PCBA	111499−001
5. SCREW, HEX (2)	102786−408
6. WASHER (2)	101526−003
7. CONNECTOR J11	(part of item 19)
8. CONNECTOR J12	(part of item 19)
9. BASE	111365−003, 112083−003
10. SCREW	105728−004
11. CABLE ANCHOR BRACKET	(part of item 19)
12. SPRING, LEFT UPPER	111980−001
13. SPRING, RIGHT	111980−001
14. SPRING, LEFT LOWER	106710−002
15. SCREW (2)	105728−004
16. PIVOT RETAINER	110181−001
17. SCREW (4)	102786−614
18. CASTING BRACE	111576−001, 111057−003
19. SHUTTLE	111057−003
20. WEAR SADDLE (2)	111906−001
21. CAP SCREW (2)	101514−042
22. SHUTTLE SHAFT	(part of item 19)
23. BASE CASTING	111663−001

TABLE B−1. PARTS LIST−continued

FIGURE AND TITLE ITEM NO/NAME	PART NO/COMMENTS

Figure 5−23. Hammer Bank Cable Assembly Removal/Installation

1. CABLE ASSEMBLY	111070−001
2. SCREW	101514−001
3. TERMINAL LUG E1	(part of item 1)
4. TERMINAL LUG E2	(part of item 1)
5. TERMINAL LUG E3	(part of item 1)
6. TERMINAL LUG E4	(part of item 1)
7. TERMINAL LUG E5	(part of item 1)
8. TIE WRAP (3)	101480−001
9. GUIDE, LINEAR MOTOR	111186−001
10. SCREW	102786−604
11. GUIDE, CABLE	111779−001
12. HAMMER BANK PCBA	(part of item 1)
13. SCREW, HEX (3)	102786−604
14. HAMMER BANK	111392−001 & 003

Figure 5−24. Hammer Spring Removal/Installation

1. COVER .	111702−001
2. SCREW (2)	140058−001
3. SHUTTLE COVER	111790−001
4. TRACTOR (2)	105786−001
5. SHUTTLE LOCK KNOB	110257−001
6. SHUTTLE ASSEMBLY	111057−001 & 003
7. HAMMER BANK COVER (ASSY)	111071−001
8. ROLL PIN (2)	(part of item 6)
9. SCREW, SOCKET HEAD	105575−001
10. HAMMER	105059−002, 109004−001
11. SCREW	105575−001
12. CLAMP PLATE	111073−001
13. POLE PIN	(part of item 6)

Figure 5−25. Hammer Coil Removal/Installation

1. HEAT SINK	(part of item 7)
2. TOP OF COIL	(part of item 7)
3. COIL WIRES	(part of item 7)
4. BOBBIN SHAFT	(part of item 7)
5. POLE PIN	(part of hammer bank)
6. HAMMER BANK CABLE (ASSY)	111070−001
7. COIL ASSEMBLY, NEW	111703−001

Figure 5−26. Encoder Removal/Installation

1. COVER	111702−001
2. RIBBON	n/a
3. SCREW (2)	140058−001
4. SHUTTLE COVER	111790−001
5. SCREW (2)	102786−606
6. SHUTTLE (ASSY)	111057−001 & 003
7. HAMMER BANK COVER (ASSY)	111071−001
8. SCREW (2)	102288−007
9. HAMMER BANK ASSEMBLY	111392−001 & 003
10. ENCODER COVER	110618−001
11. SCREW (2)	101514−053
12. ENCODER	111063−001
13. SPACER	111694−001
14. HAMMER BANK MOUNTING BAR	(part of item 6)

FIGURE AND TITLE ITEM NO/NAME	PART NO/COMMENTS

Figure 5−27. Encoder PCBA Removal/Installation

1. CONNECTOR P21	(part of item 18)
2. BASE (CASTING, MECH)	111663−001
3. SPRING	111980−001
4. SPRING	111980−001
5. SCREW (2)	105728−004
6. PIVOT RETAINER (2)	110181−001
7. SCREW (4)	102786−614
8. CASTING BRACE	111576−001
9. SCREW	105728−004
10. WASHER	101526−003
11. ANCHOR BRACKET	(part of item 12)
12. SHUTTLE ASSEMBLY	111057−001 & 003
13. SCREW (2)	101514−053
14. ENCODER BRACKET	111699−001
15. SCREW	101514−011
16. OPTICAL SENSOR	(part of item 18)
17. SCREW (2)	105728−006
18. ENCODER PCBA	111712−001

Figure 5−28. Bumper Removal/Installation

1. COVER	111702−001
2. SCREW (2)	140058−001
3. SHUTTLE COVER	111790−001
4. LOCKSCREW	101514−031
5. LOCKSCREW	101514−031
6. BUMPER, FRONT	110994−001
7. BASE (SHUTTLE)	111326−001
8. BUMPER, REAR	110994−001

Figure 5−29. Paper Feed Timing Belt Removal/Installation

1. SCREW (2)	105728−011
2. WASHER (2)	101526−037
3. BELT SHIELD	110473−001
4. RIGHT SIDE PLATE	111824−001
5. SCREW (2)	102787−108
6. MOTOR	110353−003
7. BELT	105808−001
8. SPLINE PULLEY	(part of 111298−001)
9. MOTOR PULLEY	(part of item 6)

Figure 5−30. Paper Drive Motor Removal/Installation

1. SCREW (3)	(part of item 2)
2. EMI SHIELD COVER	111430−001
3. CONNECTOR P16	(part of item 16)
4. MECHANISM DRIVER PCBA	111687−001
5. EMI SHIELD (BASE)	111428−001
6. SCREW (2)	105728−011
7. WASHER (2)	101526−037
8. BELT SHIELD	110473−001
9. RIGHT SIDE PLATE	111824−001
10. SCREW (4)	105728−001
11. BARRIER PANEL	111381−001
12. LEFT SIDE PLATE	110129−001
13. SCREW (2)	105728−011
14. NUT (2)	102789−100
15. BELT	105808−001
16. DRIVE MOTOR	110353−003

FIGURE AND TITLE ITEM NO/NAME	PART NO/COMMENTS

Figure 5−31. Spline Shaft Removal/Installation

1.	GRIP RING	101551−002
2.	SPLINE SHAFT (ASSY)	111298−001
3.	BEARING	101309−002
4.	SPRING	(part of item 6)
5.	LEFT SIDE PLATE	110129−001
6.	SPRING LINK	105741−003
7.	SCREW (2)	105728−011
8.	WASHER (2)	101526−036
9.	BELT SHIELD	110473−001
10.	RIGHT SIDE PLATE	111824−001
11.	BELT	105808−001
12.	TRACTOR, LEFT	105786−102
13.	TRACTOR, RIGHT	105786−101
14.	SCREW	105728−001
15.	BEARING CLAMP	110281−001
16.	SPLINE SHAFT KNOB	(part of item 2)

Figure 5−32. Support Shaft Removal/Installation

1.	TRACTOR (SET)	105786−001
2.	E RING	105678−003
3.	SUPPORT SHAFT	111685−001
4.	SPRING WASHER (2)	101552−004
5.	BUSHING	111684−001
6.	ADJUST KNOB	111822−001
7.	WASHER	101526−005
8.	SCREW .	101514−036
9.	LEFT SIDE PLATE	110129−001
10.	RIGHT SIDE PLATE	111824−001

Figure 5−33. Paper Ironer Removal/Installation

1.	COVER	111702−001
2.	FORMS THICKNESS LEVER	111724−001
3.	SCREW (2)	140058−001
4.	SHUTTLE COVER	111790−001
5.	SHUTTLE (ASSY)	111057−001 & 003
6.	PAPER IRONER	110408−001

Figure 5−34. Platen Removal/Installation

1.	SCREW (3)	105728−011
2.	IRONER MOUNTING PLATE	110548−001
3.	SCREW .	101514−037
4.	SETSCREW	(part of item 5)
5.	FORMS THICKNESS LEVER	111724−001
6.	PLATEN	110592−001

FIGURE AND TITLE ITEM NO/NAME	PART NO/COMMENTS

Figure 5−34. Platen Removal/Installation−continued

7.	SPRING	(part of item 9)
8.	RIGHT SIDE PLATE	111824−001
9.	SPRING LINK	105741−001
10.	RIGHT BEARING	101309−002
11.	SCREW	103677−001
12.	WASHER	101526−005
13.	SWITCH BRACKET	110144−001
14.	SCREW	105728−012
15.	SPACER	102132−007
16.	SCREW	101514−037
17.	RESTRAINT	111784−001
18.	SPRING	(part of item 20)
19.	LEFT SIDE PLATE	110129−001
20.	SPRING LINK	110280−001
21.	LEFT BEARING	101309−002
22.	LEFT ADJUSTMENT BRACKET	110579−001
23.	RIGHT ADJUSTMENT BRACKET	110579−001
24.	WASHER (2)	n/a
25.	WEAR SADDLE (2)	110579−001
26.	PAPER IRONER	110408−001
27.	HAMMER BANK COVER (ASSY)	111071−001
28.	SHUTTLE COVER	111790−001
29.	SCREW (2)	140058−001

Figure 5−35. Interlock Shield Cable Assembly Removal/Installation

1.	CONNECTOR P22	(part of 111453−001)
2.	MOTHERBOARD PCBA	111499−001
3.	FORMS THICKNESS LEVER	111724−001
4.	SCREW (2)	103677−030
5.	PLATEN OPEN SWITCH	(part of 111453−001)
6.	MOUNTING BRACKET	110144−001
7.	SCREW (2)	140058−001
8.	SHUTTLE COVER	111790−001
9.	NUT (3)	101853−006
10.	WASHER (3)	101526−028
11.	SHOCK MOUNT SPACER (3)	111974−001
12.	MECHANICS BASE	111663−001
13.	INTERLOCK SWITCH .	(part of 111453−001)
14.	HEX SCREW	105728−004
15.	PIN	(part of item 12)

Figure 5−36. Paper Detect Switch Removal/Installation

1.	CONNECTOR P25	(part of item 6)
2.	MOTHERBOARD PCBA	111499−001
3.	SCREW (4)	105728−001
4.	BARRIER PANEL	111381−001
5.	SCREW (2)	105728−001
6.	PAPER DETECT SWITCH	111338−001
7.	BASE CASTING (MECH)	111663−001

FIGURE AND TITLE ITEM NO/NAME	PART NO/COMMENTS

Figure 5−37. Ribbon Drive Motor Removal/Installation

1. FORMS THICKNESS LEVER	111724−001
2. CONNECTOR P28	(part of item 6)
3. MOTHERBOARD PCBA	111499−001
4. SCREW	(part of item 5)
5. SPOOL HUB	102526−001
6. RIBBON DRIVE MOTOR	111460−001(lft) −002(rt)
7. SCREW (3)	102786−407(lft) −406(rt)
8. WASHER (3)	101526−005
9. BASE CASTING (MECH)	111663−001

Figure 5−38. Ribbon Guide Removal/Installation

1. FORMS THICKNESS LEVER	111724−001
2. RIBBON	n/a
3. CONNECTOR P24	(part of item 7)
4. MOTHERBOARD PCBA	111499−001
5. SCREW (2)	102786−406
6. WASHER (2)	101526−005
7. LEFT RIBBON GUIDE	111463−001
8. LEFT SIDE PLATE	110129−001
9. RIGHT RIBBON GUIDE	111463−002

Figure 5−39. Blower Assembly Removal/Installation

1. SCREW (2)	140058−001
2. SHUTTLE COVER	111790−001
3. CONNECTOR P27	(part of item 7)
4. MOTHERBOARD PCBA	111499−001
5. BASE CASTING (MECH)	111663−001
6. SCREW (2)	105728−004
7. BLOWER ASSEMBLY	111464−001

Figure 5−40. Fan Removal/Installation

1. SCREW (3)	102786−614
2. FAN ASSEMBLY	110454−001
3. FAN MOUNT	(part of 111428−001)

Figure 5−41. Circuit Breaker Removal/Installation

1. LEAD CONNECTORS	n/a
2. SPRING CLIP (4)	(part of item 3)
3. CIRCUIT BREAKER	105705−001
4. MOUNTING PLATE	111423−001

FIGURE AND TITLE ITEM NO/NAME	PART NO/COMMENTS

Figure 5−42. AC Input Filter Removal/Installation

1.	NUT	n/a
2.	TERMINAL LUG	(part of item 13)
3.	STAR WASHER	n/a
4.	EMI SHIELD (BASE)	111428−001
5.	TERMINAL CONNECTOR (2)	n/a
6.	SCREW (2)	102786−606
7.	WASHER (2)	101526−037
8.	SCREW	102786−606
9.	TERMINAL TAB	101539−003
10.	STAR WASHER	101527−003
11.	SCREW	102786−604
12.	MOUNTING PLATE	111423−001
13.	FILTER	111564−001

Figure 5−43.Paper Feed Motor Pulley Removal/Installation

1.	SET SCREW (2)	(part of item 2)
2.	MOTOR PULLEY	105740−001
3.	MOTOR	110353−003

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